FEB 23 1918

In This Issue: Present Status of Insulator Depreciation

JOURNAL OF ELECTRICITY

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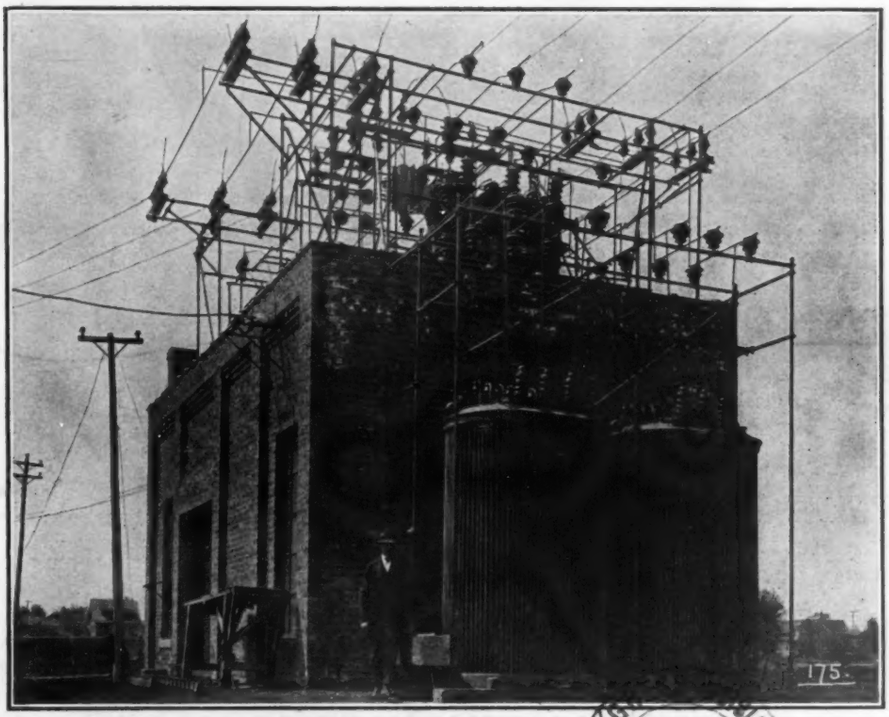
MOLONEY TRANSFORMERS



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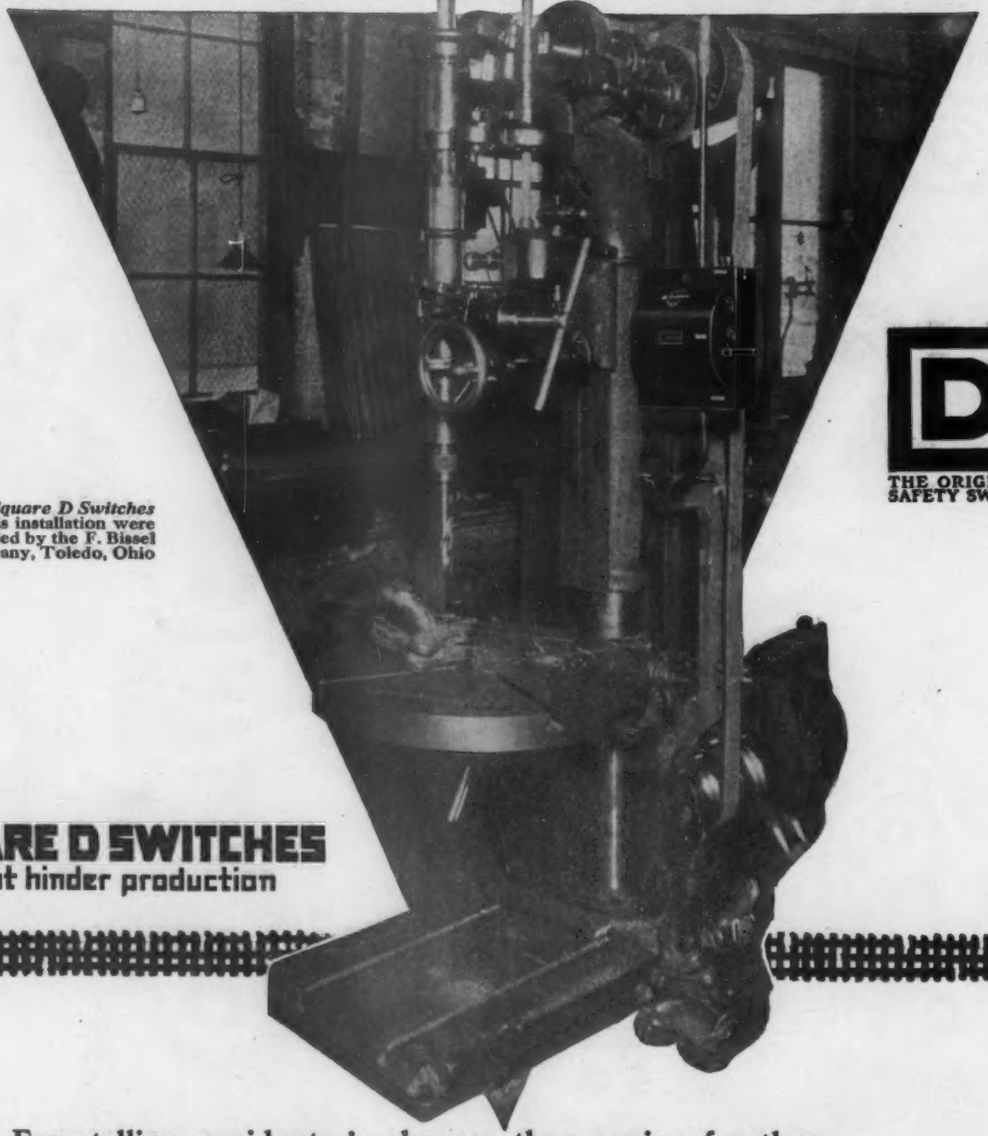

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

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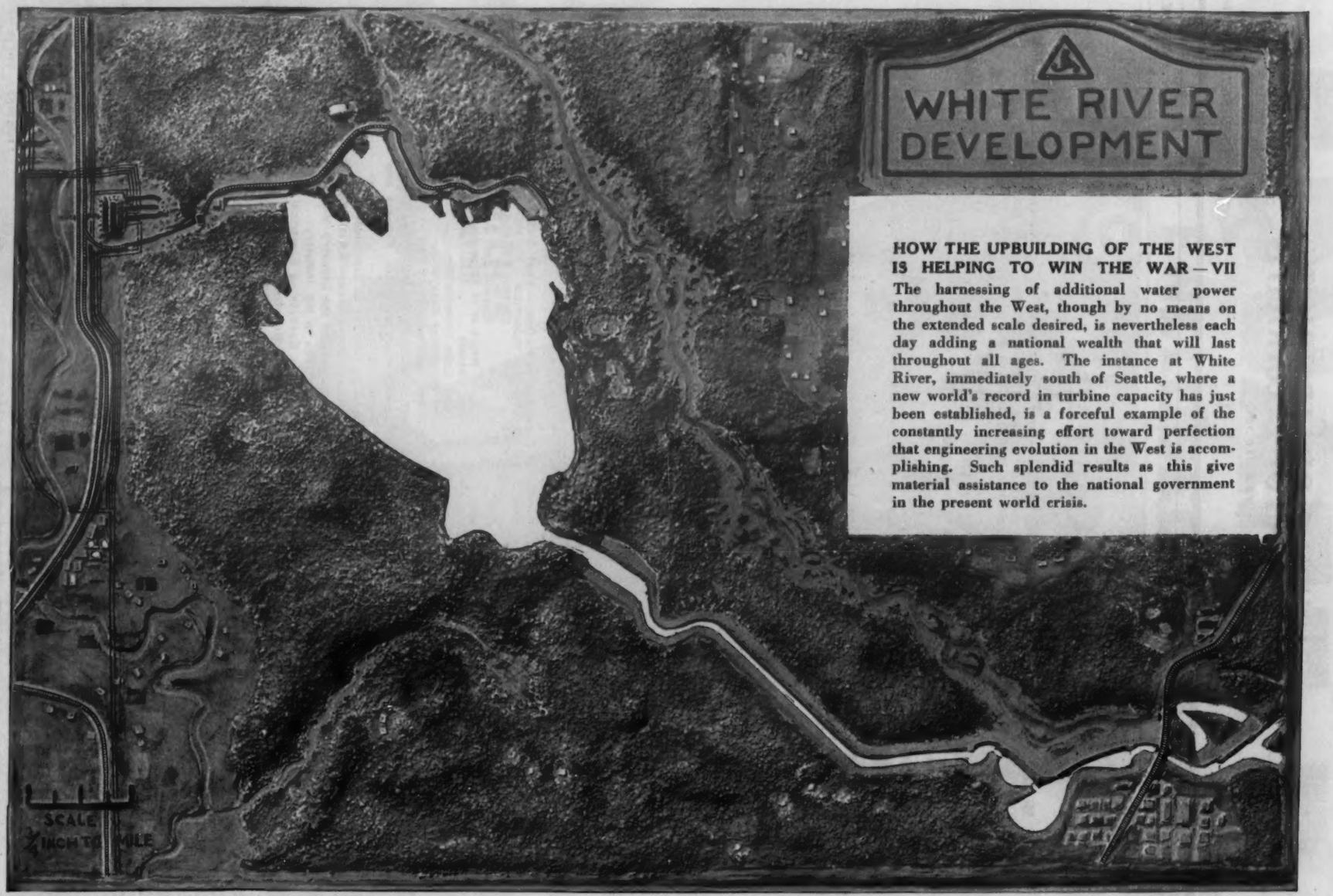
WHITE RIVER
DEVELOPMENT
HOW THE UPBUILDING OF THE WEST
IS HELPING TO WIN THE WAR — VII
The harnessing of additional water power throughout the West, though by no means on the extended scale desired, is nevertheless each day adding a national wealth that will last throughout all ages. The instance at White River, immediately south of Seattle, where a new world's record in turbine capacity has just been established, is a forceful example of the constantly increasing effort toward perfection that engineering evolution in the West is accomplishing. Such splendid results as this give material assistance to the national government in the present world crisis.
SCALE
INCH TO MILE

FEB 23 1918

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40 — SAN FRANCISCO, FEBRUARY 15, 1918 — Number 4

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WHICH ONE OF THESE TYPES ARE YOU?

1

In times of public danger, when those at the head of the government must of necessity be given unprecedented power, I believe that even men of tried faithfulness and men of lofty ideals have their sense of perception blurred and their erstwhile consecration to public service besmirched with an overpowering desire to forward private or partisan interest. I question their motives, I question their ability to analyze and meet the emergencies of the war. I have lost faith in my fellow man.

2

In a time when the very soul of man is under the trial of fire, and a nation founded upon principles of liberty and justice for all is being shaken to its innermost, I believe in my fellow citizens. Especially do I confidently put my trust in those in authority, believing that as a whole they are neither knaves nor fools, but to the best of their ability are endeavoring to bring to a successful conclusion the weighty problems entrusted to them for solution.

A remarkable convention is in the making for the Pacific Coast Section, N. E. L. A., at Del Monte, April 24-27, 1918.

A War Service Convention

It has been decided to combine three conventions into one big, pulsating, expressive body which shall meet to discuss problems of war emergency that have developed in the electrical industry of the West. The jobbers, the electrical contractors and dealers, and the central station men, meeting in earnest sessions bent upon making the Del Monte gathering the one big effective effort of the year, are bound to bring about results that will be lasting and most helpful in these critical times.

The entire Thursday session of the convention is to be given over to a discussion of engineering problems that have arisen to meet the emergencies of the hour—the shortage of fuel, the lack of efficient labor, the growing scarcity of hydro-electric energy, and the new problems due to interconnection on a vast and hitherto unattempted scale of operation.

On the other hand, the commercial section has problems to present for discussion that are difficult of solution and of great timely value in the field of merchandising. As a consequence, the entire Friday sessions will be devoted to the commercial section discussions, so that all attending the convention may have an opportunity to participate.

These war emergency problems are not only of great timely interest to California and other states represented in the Pacific Coast Section, but considerable interest is being shown by prominent men in the Northwest Electric Light and Power Association, and as a consequence, a goodly representation from those states is anticipated at the Del Monte gathering.

The conserving of effort by converting three conventions into one is a great saving of time and effort in these strenuous days. The emphasis made upon the discussion of war emergency problems assures a strong and representative gathering from all quarters.

Never before in the history of the industry did a time exist when greater need was felt for a getting together and a discussion of matters of common concern. And from every visible appearance the record-breaking attendance at this convention, and the consequent discussion of war emergency problems, will bear out this fact.

Fuel Substitutes

The fuel shortage is one of the outstanding problems of the war. Of course, in great measure, it is a temporary affair to be eased off with spring weather and a greater facility in transportation, but abnormal demands, together with the working out of the economic factors of war regulation, are bound to mean high prices and minor shortages, at least through the duration of the war. The reaction to this condition naturally will be the substitution of other fuels for coal and oil wherever possible, and the working out of more efficient methods of combustion. The articles on powdered coal and bagasse as a source of fuel, appearing elsewhere in this issue, are interesting records of experiments already carried out in response to these two tendencies. The Pacific Northwest is finding it possible to use low grade coals in powdered form for factories and power plants. The utilization of the waste products of sugar refining has long been practiced, as have most of our other economies of the scrap heap, but never so intensively nor to

such good purpose as today under the spur of war necessity.

Such experiments are wholly in the interest of progress. As with so many of our war-time changes, much of the construction is permanent and easily adapted to peace conditions. The war has merely intensified and hastened a need which we would have had to meet eventually.

As a comparatively young country, the United States has up to now been a wasteful spender. The continent was so large and the country undergoing such rapid growth that it was more important to do things on a large scale than to do them efficiently. In consequence we have used lavishly and wasted gloriously. The time was coming, however, even before the war, when we could no longer claim the indulgence of youth for our folly. We must utilize our scrap heap and re-work our dump piles. Whatever the war calls forth in more efficient methods of fuel using and in the farther utilization of material hitherto wasted, is a permanent gain. The time is, unfortunately, not so far off when our coal and oil supplies will be exhausted and some other source of power must fill the need. Of course the fuel shortage in this sense is not an immediate problem, but it is always the age before the new era which prepares for its establishment. The discovery of new fuels and methods for the better adaptation of the ones we have is not only a war service, but it is one of the problems whose solution is a duty this age owes to progress.

But this problem of saving the fuel supply has even a deeper significance to the West. Blessed with giant possibilities in water power development, it is at once seen that the real salvation of the fuel situation is to develop and extend at once this great natural resource to its fullest measure of efficiency.

The High Tension Insulator Problem

In 1915 and 1916 the failure of insulators on some long distance transmission lines resulted so disastrously in the way of interruptions that it was evident something had to be done unless the present generation were content to relegate long distance service to the category of intermittent or second class power. Yet the committee on transmission and distribution of the American Institute of Electrical Engineers during 1917 practically threw up its hands in despair in reporting progress on actual results accomplished.

On the Pacific Coast at the present time considerable attention is being paid to this problem, which is so closely connected with the success or failure of hydro-electric development in the West.

On another page of this issue wil' be found an excellent article on the present status of insulator depreciation by C. E. Oakes, a technical specialist with the United States Bureau of Standards at Washington. The author shows a wonderful grasp of the subject at hand, and this thoroughness speaks well for the efficient service that is being rendered the West by the Bureau of Standards.

The insulator problem is now also receiving the especial attention of the engineering section of the Pacific Coast Section, N. E. L. A. A considerable appropriation of money has been made to assist in research work that has been undertaken at Leland Stanford University under the direction of Professor Harris J. Ryan, who in the past has rendered such valuable assistance to the electrical industry along research lines. The particular investigation covers a series of tests of the effects of accelerated cyclic changes in temperature on suspension elements of various design, both with and without hardware.

Thus far it has developed that recent improvements in the manufacture of porcelain appear to have eliminated porosity as the cause of insulator failures. The trouble experienced with porcelain of recent manufacture appears to be due to strains set up by thermal expansion and contraction that cause minute cracks, into which moisture subsequently penetrates, resulting in failure.

The conclusions, however, are only tentative, and it is hoped that exhaustive tests may be put through so as to advance the insulator problem to a more secure basis.

At the laboratories of the Bureau of Standards some helpful experiments are under way. As brought out by the writer in the article appearing in this issue, according to the generally accepted theory that hardened cement is a substance of gelatinous nature, each particle of cement on reacting with water swells and becomes a gelatinous mass cementing the particles of sand together. On this theory the finer the particles of cement, the more completely will they be hydrated. These interesting experiments that are being conducted by the Bureau of Standards are being undertaken to see what results may be expected from the use of very fine particles of cement. While thus far the experiments are not conclusive, the results evidently point to ultimate good resulting from the investigation, and it is hoped may lead to the development of a cement elastic enough to accomodate all changes in length due to temperature.

The entire insulator problem is one that needs the co-operative assistance from all sections of the nation, for from the operating data of present hydro-electric systems could be ascertained the relative amount and cause of depreciation of insulators in storage, the effect of the season of the year on the number of failures, the relative failures ascribable to the use of cement, the average number of failures for the various disk positions, and the effectiveness of arcing horns and ground wires.

It is to be hoped that the current year will see much of this co-operative helpfulness brought to a concrete reality on the part of the various hydro-electric companies of the nation, and that the excellent research facilities of the various universities and the Bureau of Standards will be taken advantage of to the limit.

The Engineer and the Salesman

During the past semi-monthly period an unusual gathering has taken place at one of the League meetings in the West — that of the Electrical Development League in San Francisco. The occasion was the entertainment of a number of noted civil engineers as honored guests. In response

to a call from the chairman of the meeting for a word on co-operation between civil engineers and electrical men, H. J. Brunnier, acting president of the San Francisco Association of the American Society of Civil Engineers, brought out the fact that the engineer can learn much from the salesman.

This fact may indeed well be emphasized. Too often in the past has the engineer stood aloof and at times been so unapproachable as to make it appear that he had nothing in common with the technical man endeavoring to sell to him certain electrical ware.

In recent trying months when shortage in deliveries has been observed on all sides, the tables have been reversed and often the commercial salesman has had an opportunity to repay courtesies or discourtesies shown him in months past.

The whole matter, viewed in its broadest aspects, is subject to careful consideration. The engineer on the one hand, responsible to his client as a technical adviser, has certain definite duties to perform, while the salesman on the other hand, keen and alert to varying conditions of the trade and new advances in the art, has much to offer that is well worth the attention of the engineer.

To keep abreast of the times this personal contact of the engineer with the salesman is almost imperative. New suggestions and new ideas are constantly brought out almost unconsciously in these interviews.

Once again a higher and more helpful co-operation is possible between the engineer and the man of the industry in commercial practice, and it is gratifying to note that this new spirit of helpfulness has again been initiated in the West.

Notations on Labor Conditions in the Orient

The increasing engineering and commercial activity between America and Oriental points makes the study of the customs of the people in the Far East of timely importance. Some idea of the labor situation can best perhaps be arrived at by discussing certain of the prevailing racial characteristics one encounters in going from country to country in that section of the world.

In traveling from Japan and China to the Philippine Islands, one is very forcefully impressed with the extreme differences of human activity displayed. The Japanese and Chinese are industrious and active in the extreme. They never stop work. One sees them in the early hours of the morning at their tasks, and late at night they are industriously engaged in computing up their household accounts. Undoubtedly climate alone is not to account for this, since in Hong Kong, although the humid, enervating air of the Philippines prevails, still the native is industrious. The keen struggle for existence has undoubtedly been the most potent factor in the development of their native zest for work.

What a change when one observes the native Philippino! The possessor of a rich, fertile soil, unhampered in population, the Philippino works for a living as a secondary consideration. Hence, the question of labor is easily solved in Japan and especially in China, but in the Philippine Islands it is still a serious problem.

In Japan a tremendous socialistic wave is sweeping the country. The struggle for life has brought them face to face with an intense study of socialistic problems. It is believed that the zest with which they are prosecuting the working out of their labor conditions will eventually result in much good coming from it.

Nearly all the domestic work and such other work wherein Oriental labor is employed in China or upon ocean going vessels is done through the "Number One" boy. He it is who is the responsible party, employs the other boys, and generally acts as the guiding spirit for the work. Incidentally, of course, he it is who receives all the commissions, rake-offs, and other subtle rewards which he is able to wring out of all natives stores and houses with which his master deals.

The house boy service is, however, exceptionally efficient, and with all its drawbacks, is most to be desired in China. In Shanghai, a house boy may be gotten to keep himself with board and meals and be always at your beck and call for five dollars a month (American money). And when one says to be always at your beck and call, it may almost be taken literally, for your "room boy" wakes you up in the morning, puts within near reach your collar and necktie which he has observed that you fancy most, serves you tea while you are still in bed, prepares your bath, and in fact does every conceivable thing for you that your fancy may desire.

It is always "Boy, do this," or "Boy, do that." An enthusiastic American who was a resident of Shanghai, asked how he liked living there, replied: "Oh, I like it, for I've heard the Call of the East." In response to the question, "What is the Call of the East?" his quick answer was, "Boy!" The Oriental luxury and ease with which one accustoms himself in the Far East is indeed hard to break away from when returning to America.

The one fact above all others that stands out when one reviews in mind the employment of labor in the Orient, is that the laborer, after all, is human, possessing a heart that may be softened and hands that may be quickened directly in proportion to the humanitarian effort shown by his employer.

THE NEW JOURNAL SERVICE: Proper and effective advertising through the local press is a subject of great importance in the merchandising of electrical ware. It is with unusual pleasure that we initiate in this issue a series of articles on "Odds and Ends of Selling Psychology" by H. A. Lemmon, salesmanager of the Truckee River General Electric Company. Mr. Lemmon is a well-known authority on this subject, and as a consequence this series will undoubtedly be followed with widespread interest.

Another series of timely articles is that on Inductive Interference by D. I. Cone, an investigator for the Joint Committee on Inductive Interference, who has devoted years of study to this subject, and now steps down this intricate matter in language easily understood.

The successful closing of the subscription contest of the Journal of Electricity, announced in full elsewhere, has marked a signal advance in the effective circulation of the Journal. With such substantial backing shown on all sides by readers of the Journal of Electricity, its prestige is at once placed upon a higher plane of usefulness. The Journal of Electricity extends to all who have aided in this timely campaign its deepest and heartfelt appreciation.

THE MOST POWERFUL TURBINE IN THE WORLD

BY F. SCHMIDT

(Among the world records in the electrical field of which the West is proud is to be numbered the installation on the White River of the most powerful turbine in the world. In view of the interest attaching to the electrification of the Chicago, Milwaukee & St. Paul in its extension westward, and the call for new power, this subject is one of particular appeal. A description of the plant, with the problems and achievements in construction and operation, is here presented by a man who is engineer in charge of design in the hydraulic department with the firm manufacturing the turbine.—The Editor.)

Intake gates and gate house

The commercial results obtained from the operation of the electrified Rocky Mountain Division of the Chicago, Milwaukee and St. Paul Railroad have been so eminently satisfactory that it was decided to immediately proceed with the electrification of the Cascade Mountain Division, which extends from Othello, east of the Columbia River over the Cascades, to the end of the transcontinental line at Seattle and Tacoma. The western slope of the Cascade Mountain Division will receive about 25,000 kilowatt of electrical energy from the Puget Sound Traction, Light & Power Company, at Seattle, Wash. This concern has a number of hydro-electric plants, the largest of which is the so-called White River Plant near Sumner, Wash. The plant with an initially rated output of 36,000 horsepower developed by two hydro-electric units, was placed in commercial operation in November, 1911, and has since delivered power uninterruptedly and without involving expenses for repair. It was found that the turbines and generators can carry without difficulty or detriment to their efficiency, a total load of 30,000 or 40,000 horsepower on the shaft.

The plant has been laid out with a view of maintaining the highest economy of water since it is combined with a large storage capacity, which serves to furnish the necessary water during dry season.

Bellmouth of the flume, first basin, under water

600,000 yard cut and covered flume—outlet canal

The course of the White River, a typical mountain stream, fed from one of the glaciers of Mount Rainier, is blocked by a timber crib dam near Buckley, Wash., on one of the branches of the Northern Pacific Transcontinental Line. The water is controlled by rugged steel gates and led through a heavy timber flume into a forebay, which serves as a settling basin for the glacial silt carried by the river at times in large quan-

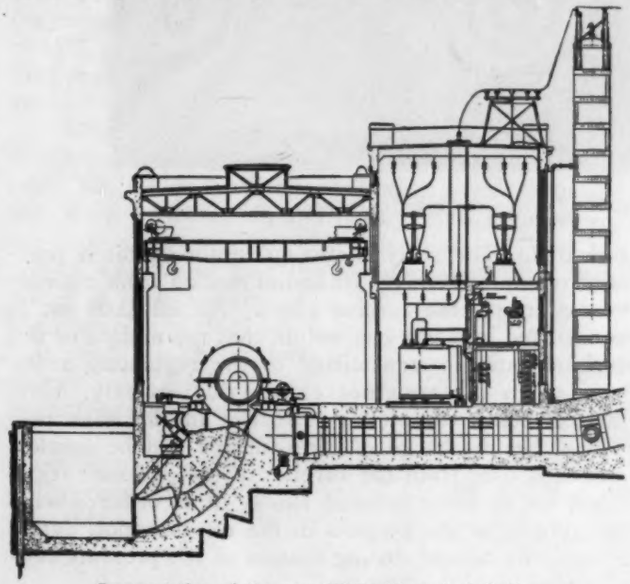
tities. Provision is made for draining and flushing this forebay to prevent its being filled up with deposits.

An open canal leads to the storage reservoir, called Lake Tapps, which was a small natural lake now greatly enlarged by raising its water level about 35 feet, and by bringing the storage capacity of this lake up to 2¼ billion cubic feet, equivalent to 18,000,000 kilowatt hours obtained under the net head of 440 feet.

From Lake Tapps the water is carried through a deep open cut and a tunnel about 12 feet in diameter and about 3,000 feet long, intended to carry 1,500 cubic feet per second, which is half of the total ultimate flow. The other half will be carried in an additional tunnel to be built later.

The generator room

The tunnel ends in a circular forebay about 75 feet deep and 30 feet diameter, serving as equalizing reservoir with spillway, built back in the hill about 250 feet from the western slope of the hill. From this forebay three individual steel penstocks are placed in concrete lined tunnels leading to the slope of the hill. Each pipe has a diameter of eight feet at the top and six and one-half feet at the power house, and is about 2,500 feet long. At the point where each pipe begins to slope down there is a steel vent-pipe six feet in diameter and 85 feet high which again serves to assist the water in its acceleration or retardation during the load changes, and to prevent a collapse of the pipe in case the gates at the forebay are closed.



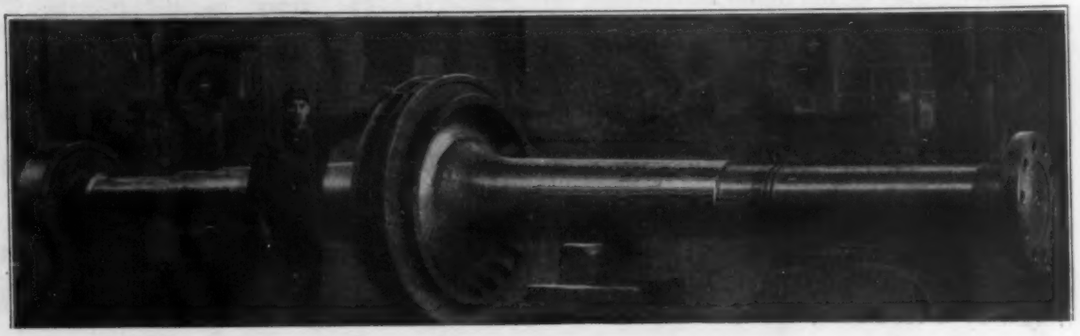
Cross section of the new White River installation

In order to adhere to the principle of conservation of the stored hydraulic energy of this plant, it was necessary to provide hydraulic equipment which is capable of controlling the bulk of the momentary variation of the commercial load of the Puget Sound Traction System. This variation is sometimes very severe, owing to rapid and large changes of the power required by freight trains of the Puget Sound Traction Company lines.

The long tunnel combined with the steel pipe lines, together with the requirement of a water-saving method and of speed regulation under heavy fluctuations of load over a high tension transmission line, offered a problem to the hydro-mechanical engineer, which required careful study and practical experience.

In order to prevent excessive variations in speed and voltage of the power system it was necessary to use a very sensitive governor and to quickly control the gates of the turbine. A sudden change in the flow of the water through the pipe lines and tunnel would cause pressure variation, which would not only impair the regulation but might accumulate to such extent that they would wreck the whole plant. A careful analysis of all the precautionary methods was made and as a result of same it was decided to use:

1. A surge reservoir at the end of the tunnel for the purpose of moderating the surges set up in the tunnel.



Runner and shaft with forged flange coupling and brake pulley

Third unit completely assembled. Note butterfly valve and regulating cylinder

2. Pressure regulators so combined with the turbines that they permit of a sudden release of the water otherwise brought to a stop in the penstock when the governor closes the gates of the turbines quickly. In order to prevent excessive waste of water, these releases or by-passes slowly and automatically close within a rate so adjusted that the flow is gradually stopped without causing any appreciable secondary rise.

3. Air cushion tanks, located close to the turbines which supply energy to same, when demand of load is so sudden that the water cannot accelerate in the pipe line sufficiently fast to prevent a serious drop in pressure.

The proper combination of these three devices, together with a fairly liberal flywheel effect of the revolving parts of the generators, made it possible to attain an accuracy in speed regulation which has been the subject of considerable comment in engineering circles.

The turbines of the initial installation were made of the double discharge horizontal shaft spiral case type of 18,000 horsepower capacity each operative under a net head of 440 feet at 360 R. P. M.

A governor-operated, and a pressure-operated pressure regulator are directly connected to a branch pipe provided on the lower portion of the spiral casing. Each consists of an elbow with a circular disc-valve, opening and discharging water downwardly through a plate steel pipe into the tail race. This disc-valve is connected to a piston subjected to water pressure controlled by a regulating valve, which in turn is relay operated. The relay of the governor-operated pressure regulator receives its initial motion from a direct connection to the turbine gates. An oil dash pot is so inserted into this connection that the motion of the turbine gates is transmitted to the regulating valve only when the governor closes this quickly, slow motion being completely absorbed in the dash pot. Thus the discharge of the turbine can be quickly switched over from the turbine to the pressure regulator, and is there reduced slowly in accordance with the setting of the by-pass in the oil dash pot, determining the rate of closing motion of the pressure regulator.

The turbine discharges about 450 cubic feet of water per second, and when the flow is stopped through the turbine gates in one and one-half seconds it will discharge through the pressure regulator to its full amount by the time the governor has closed the turbine gates. Thus the velocity of the water in the pipe line is not changed and is slowly reduced thereafter so that no serious pressure rises occur.

The relay of the pressure-operated pressure regulator receives its initial motion from a plunger weighted by a compressed spring. This plunger is subjected to oil under pressure out of a tank which communicates directly with the water under pressure in the main penstock. Any variation of pressure changes the compression of the spring, this causing an initial motion of the relay of the pressure regulator. The spring is so set that pressure rises exceeding 15% above normal cause the pressure operated pressure regulator to begin its function.

As a third means of protection of the turbine, a

bursting plate is placed in the neck of the "Y" pipe making connection between the turbine casing and the two pressure regulators. The bursting plate is to give way only in case the pressure should rise to 50% above normal. A hand-operated gate valve permits of replacement of this plate without necessitating interruption in service.

After the units were placed in commercial operation elaborate efficiency and regulation tests were carried out. It was found that the efficiency exceeded 90% and was still above 80% at about one-fifth of the total load.

Roof towers, outside line switches and air chambers

The full load of 20,000 horsepower was thrown off suddenly, causing the governor to close the gates quickly. The speed did not rise more than 12% above normal and the maximum pressure rise in the pipe line above normal did not exceed 5½%, as against a guaranteed pressure rise of 15% and a speed of 18%. On a 20% load change, the speed did not vary more than 1½%, as against a guarantee of 5%.

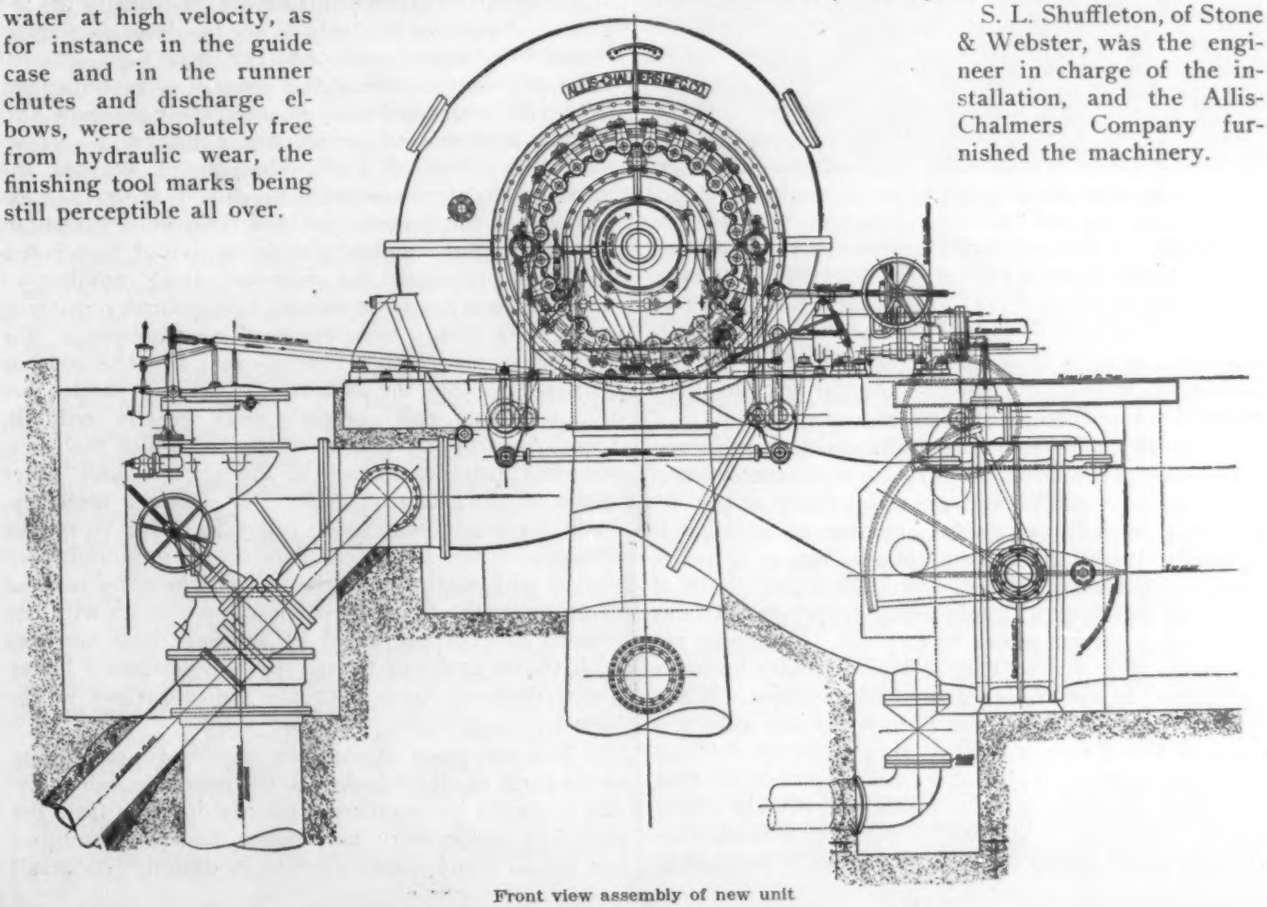
After five years of continuous service, one of these turbines was opened for careful examination. The parts subject to hydraulic and mechanical wear and tear were measured up and photographs taken in order to establish proof of their durability.

It was found that the surfaces in contact with water at high velocity, as for instance in the guide case and in the runner chutes and discharge elbows, were absolutely free from hydraulic wear, the finishing tool marks being still perceptible all over.

The results of this examination were so gratifying that it was decided to build the third new unit practically a duplicate of the first two units. The excellent results obtained as regards efficiency and speed regulation encouraged the company to increase the rated horsepower from 18,000 of the original contract to 23,000 horsepower without increasing any parts except those directly affected, that is the runner, shafts, guide vanes, etc.

It is expected that 25,000 horsepower will be delivered by this new turbine to the generator shaft and that both the efficiency and the speed regulation will be as satisfactory as they are with the first units.

S. L. Shuffleton, of Stone & Webster, was the engineer in charge of the installation, and the Allis-Chalmers Company furnished the machinery.



Front view assembly of new unit

PRESENT STATUS OF INSULATOR DEPRECIATION

BY C. E. OAKES

(The difficulties of early failure of insulators have presented a problem of nation-wide importance on high-voltage lines. Several of the Pacific Coast companies have already gotten together to try and devise adequate acceptance tests, and the federal authorities have carried on numerous experiments with that end in view. The results of these investigations, the advances made and the needs still remaining, are here authoritatively reviewed by a man who is special investigator for the Bureau of Standards at Washington, and who has been intimately connected with this work.—The Editor.)

The rapidity with which deterioration and ultimate failure of insulators in every part of the country is occurring has caused the problems to be investigated by various individuals or groups of individuals, in order to arrive at a satisfactory solution. Within the past two years a number of companies operating on the Pacific Coast, realizing the importance of the problem, collaborated in conducting an extensive investigation of the effect of porosity on insulator deterioration and of the possibility of using insulation resistance as a possible criterion for acceptance tests. The successful solution of the problem calls for like co-operation between the operating companies of not only one community, but of the country as a whole. Insulator troubles are experienced in a greater or less degree on every high-voltage line in the United States. The co-operation so successfully started in the West should be so extended as to be nation-wide. Perhaps the best instrument suited to this purpose would be one of the engineering societies, actively supported by the operating companies.

As is evidenced by recent papers on the subject, engineers recognize two main hypotheses by means of which insulator failures can be explained. These are (1) porosity and (2) mechanical cracking due to expansion of the metallic and cemented parts. These hypotheses are built upon the results of numerous investigations of effects and not causes. Herein lies the diffculty in solving the problem. If the causes of insulator deterioration were known, an effective procedure in investigating them could be more easily developed and carried out and means specified to alleviate the condition. The very fact that two such hypotheses exist is prima facie evidence that the analysis of operating data on the failures of insulators and of the contributing causes thereto have not been extensive enough. It is in this field of investigation that co-operation among the various operating utilities is especially beneficial and desirable.

Porosity, and the resulting absorption of moisture, a measure of which is the insulation resistance, is of course present in all insulators to a greater or less degree. Up to the present time, however, no evidence is at hand to justify the inclusion of a resistance measurement in an acceptance test from which the length of time the insulator will successfully operate without excessive depreciation can be foretold. Numerous experiments have proved that porcelain rapidly becomes an electrolyte with an increase in temperature. When it is also considered that porcelain which has absorbed more or less water is already an electrolyte, failures are to be expected. It is not reasonable to assume that this cause of insulator depreciation will ever be eliminated. The rapid strides which insulator manufacturers have made during the past four years in perfecting the control of their product during the process of manufacture, has resulted and no doubt will continue to result in an ever-lessening percentage of total failures due to absorption. An extended analysis of operating data on lines on which late designs are now in service is needed.

There are very good reasons for believing that a large percent of the total failures are due to cracking of the porcelain in the insulators. The many factors which contribute to the mechanical stresses to which an insulator is subjected complicate the problem of ascribing causes to a given failure. Among the factors which cause undue stresses can be named:

(1) Faulty design of the insulator itself. Certain designs, on subjecting the insulator to abnormal and rapid changes in temperature, allow greater expansion in one part than in another and hence develop high internal stresses. (2) The thermal coefficient of expansion of porcelain is about one-half that of steel. (3) Stresses set up in the insulator due to the change in volume of the cement under varying weather conditions. (4) The gradual increase with time in volume of the cement.

The earlier types of insulators, easpecially the pin type, had parts of the body of the insulator so proportioned in relation to one another that high internal stresses resulted during the process of manufacture. While these stresses were existent, their presence during the first year of service was not harmful. However, the effect of cyclic changes in weather, the growth of cement and the difference in the rate of expansion of the cement and porcelain with variations in temperature, combined with the initial high internal stress, produced an ever-increasing number of cracks. In order to overcome this difficulty material changes in design were made. The thickness of the shells was made more nearly equal and the contour so designed that the area of the bearing surface between cement and porcelain was greatly reduced, thereby shortening the "lever arm" on which the force, resulting from expansion of the cement and other shells of the insulator, acts. The general tendency, both in pin and suspension types, has been to reduce the area of the cemented surface to a minimum consistent with mechanical reliability. The older method of grooving the surfaces which are in contact with the cement has been replaced by sanding these surfaces with coarse grain particles. By this process a better distribution of stress over the entire surface is obtained.

The enormous stresses in insulators employing metal parts rigidly attached to the porcelain, which result when the temperature is greatly different from the assembly temperature, are known, and this condition has led to many improvements in design. As small

caps as are practical to use from a mechanical standpoint are now employed, care being taken in assembly to insure an adequate separation between the cap and the porcelain at every point. In the present cap-and-stud type, the possibility of eliminating the shearing stresses in the porcelain, occasioned by the change in length of the metal with varying temperatures, is remote. Herein lies an important field of investigation. The development of a cement elastic enough to accommodate all changes in length due to temperature is needed. The other possibility is to eliminate cement from the insulator altogether, and at the same time to introduce no equally undesirable features.

The question of the effects produced by the changes in the volume of the cement with varying temperature changes has received consideration from time to time, manufacturers being especially diligent in their quest for the best quality of cement obtainable. Investigations undertaken by various individuals have disclosed the fact that cement will contract and expand when subjected to variable moisture conditions. The experiments[1] of Mr. A. H. White have shown that cement will contract when changed from a state of moisture to a dry condition, and will expand when subjected to a reversal of the above conditions. Furthermore, it was shown that a cyclic change from a moist condition to that of dryness and back to a moist state will cause a gradual growth in the cement. This increase in length can be explained on the theory that hydration is accomplished slowly, the effect of the alternate expansion and contraction acting in such a manner that the inert material which had previously been sealed up is exposed to the weather and is then hydrated, this action being accompanied by a slightly increased volume. When it is considered that the thermal coefficient of linear expansion of cement is 0.0000055 per degree of Fahrenheit (the temperature coefficient of porcelain is 0.0000017), and that the increase in length as shown by these tests is from one hundred to five hundred times this amount, the magnitude of the resulting stresses can be more readily realized.

Knowing that this condition obtains, the next logical step would be the production of cement which would be practically entirely hydrated during the first few days of drying.

In accordance with the generally accepted theory that hardened cement is a colloid, each particle of cement on reacting with water swells and becomes a gelatinous mass cementing the particles of sand together. The size of the particles of cement will therefore determine the relative amount of water which each particle takes up, an arrested stage in the hydration being reached where the water is no longer able to easily force its way through the colloidal covering of the kernel of cement. Therefore the finer the particles of cement the more completely will they be hydrated. In order to see what results could be expected from the use of such cement, Mr. H. S. Phelps and Mr. J. C. Pearson, of the Bureau of Standards, in March, 1917, undertook some preliminary experiments, which are still in progress, the results of which are summarized below.

[1]Proceedings American Society for Testing Materials, Vol. XIV, Part II, 1914, p. 204.

Several receptacles, or "pigs," were constructed as illustrated in Figure 1, the legs being provided for the greater accuracy obtainable in reading the expansion. The radius of the cement cylinder was 0.6 in., and the radius of the leg measured to the center of the ball as shown was 1.7 in. Duplicate samples were made up from cement of various degrees of fineness and of the proportions as stated in the following table, and after the initial setting, were placed in water, and kept under water throughout the experiment.

A. Neat cement.

B. Cement (total volume taken equal to that used in A) passing 200-mesh sieve; sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to the particles of cement retained on 200-mesh sieve.

C. Cement less than 0.00252 in. (0.064 mm.) in diameter resulting from total volume taken equal to that used in A. Sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to particles of cement removed.

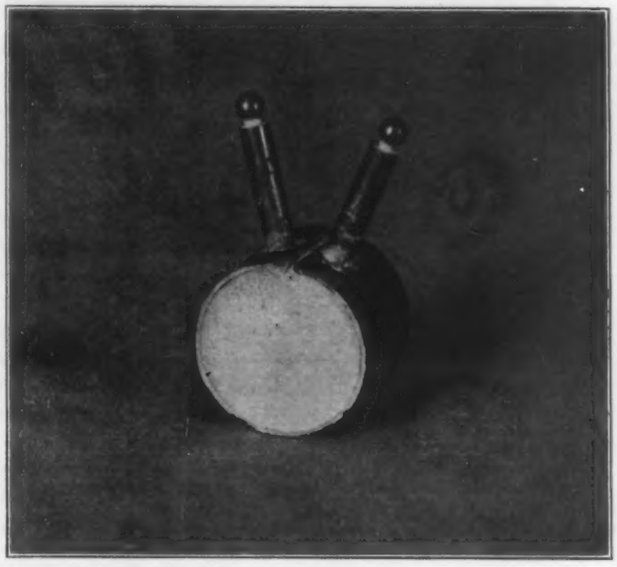


Fig. 1.—A receptacle or "pig" for testing the expansion of concrete

D. Cement less than 0.001575 in. (0.04 mm.) in diameter resulting from total volume taken equal to that used in A; sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0..2835 mm.)] was added equal in volume to the particles of cement removed.

E. Cement less than 0.00078 in. (0.0198 mm.) in diameter, resulting from total volume taken equal to that used in A; sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to particles of cement removed.

Samples of each of the above mixtures were broken after a seven-day interval with the following results:

A. Slightly above 7850 lbs. per sq. in. (553 kg. per sq. cm.)
B. Slightly above 7850 lbs. per sq. in. (553 kg. per sq. cm.)
C. Slightly above 7819 lbs. per sq. in (551 kg. per sq. cm.)
D. Slightly above 7850 lbs. per sq. in. (553 kg. per sq. cm.)
E. Slightly above 5978 lbs. per sq. in. (421 kg. per sq. cm.)

The ultimate breaking strength of test pieces A and B slightly exceeded the capacity of the testing machine. However, from tests on other samples from the same cement it is known that the breaking strength is about that indicated.

Figure 2 shows the increase in length of the specimen up to date, the letters on the curves corresponding to those in the table. The curves are an average of the

readings of duplicate specimens. The error of measurement was probably plus or minus 0.002 mm. The uncertainty of measurement due to uncontrolled conditions was probably plus or minus 0.011 mm. The striking characteristic exhibited by the curves is the very much greater growth exhibited by the specimen containing the coarser particles of cement, and the rapidity with which specimen E attained its maximum growth, which was probably in the neighborhod of 60 days. The maximum growth has not been reached in any one of the specimens except for specimen E. The maximum percent increase shown by specimen E was 0.011, and by specimen A, 0.0945. While the strength of specimen E is lower than the others, it is thought that its strength will not decrease with age, while the others will probably diminish to a considerable extent. This is anticipated in specimens A, B and C particularly, and is a well-estab'ished phenomenon in normal cement.

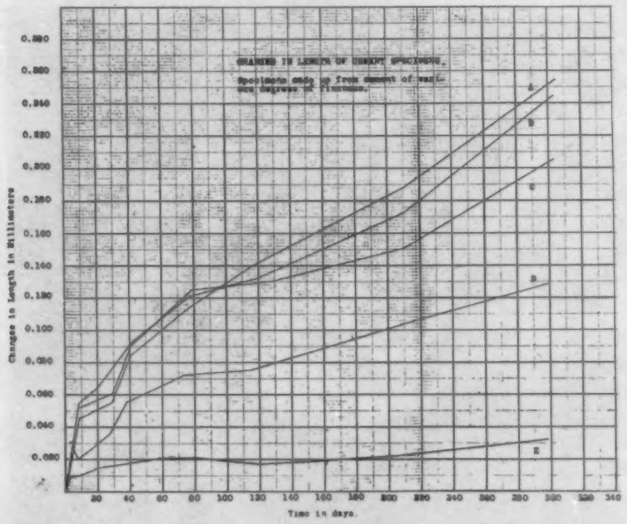


Fig. 2.—Chart showing increase in length of the various specimens of concrete

In order to obtain the required degree of fineness the cement used in the specimens C, D and E was subjected to a special process of air-presure separation. This method is not commercially in use at present so far as known, but there are no physical difficulties to impede its rapid development and commercial introduction, providing the demand for such a product is justified. These experiments are not conclusive and more extensive tests are needed, but they will serve to show the results which can reasonably be expected from a proper knowledge of the proper manipulation of the cement.

Much has been written on the subject of porosity and cracking in insulators, special importance attaching to the papers of Professors Creighton and Ryan and the latter's associates in the technical press, and of Messrs. Austin, Peek, Brundige and Peaslee, which have appeared from time to time in the proceedings of the American Institute of Electrical Engineers. There has, however, been no concerted effort made on the part of any group of investigators to gather together and analyze operating data bearing on the question.

A great number of the faults which have appeared are exhibited only by the older types. Whether the newer types are also exhibiting as large a percentage of failures is doubtful, and can be answered only by a thorough analysis of operating data collected from numerous sources. Time is, of course, the determining factor in showing up the performance of the insulator and it can be safely said that the development of the art in design and manufacture has been so rapid that the time during which the newer types have been in operation has not been sufficient to really judge their performance.

Such analysis of operating data as have appeared in the technical periodicals have been accounts of experiences of individual cases or companies. These are in a sense special cases, and as such, dependence can not be placed on the conclusions reached. The need, then, for a thorough review of the whole situation from an operating standpoint, covering representative utilities in various parts of the country, is evident. Such an investigation could without doubt be most easily conducted by one of the engineering societies whose facilities for co-operation and intercourse among the various utilities is unexcelled. The difficulties to be encountered in an analysis of this kind would be the lack of reliable records and the inevitable "personal equation" which nearly always enters. Conclusive results must be based on reliable evidence and data should therefore always be taken from chronological records. Opinions as to possible causes of phenomena observed should not be the basis from which conclusions are reached; an accurate description of the phenomena observed is much more desirable.

An extensive study of operating data will solve several problems, solutions for which have heretofore been obtained only "by rule of thumb" methods. It should be entirely possible to establish an empirical relation between a given standard of performance and the frequency of inspection and reinsulation of lines on the basis of the best obtainable economy. The question of the effect of mechanical loads can be determined from the relative number of failures of strain and suspension types which have been in service under similar conditions. Whether the element of time during which an insulator is under mechanical load is a factor which will contribute to the deterioration in strain insulators is not known at present.

Other much mooted questions which could be partially or wholly solved by an analysis of operating data are (1) the relative amount and cause of depreciation of insulators in storage; (2) the effect of the season of the year on the number of failures; (3) the relative number of failures ascribable to the use of cement; (4) the average number of failures for the various disk positions; (5) effectiveness of arcing horns and of ground wires.

There are many experimental investigations which can be undertaken with the assurance that the results obtained will prove valuable. The development within the past few years of a type of suspension insulator which does not employ cement in the assembly, and in which the distribution of electrical stresses is practically uniform, presents a problem for the research investigator. Researches conducted on this type, as compared to other types, which will show the distribution of stress, would be exceedingly valuable. The

method employed by J. F. H. Douglas[2] in his investigation of the distribution of magnetic flux in machines, and more recently by Chester W. Rice[3] in his investigations of the distribution of dielectric flux around bushings, could be adapted to this investigation.

The problem of obtaining a suitable method for measuring the porosity in insulators is still unsolved. The measurements and comparison of the power-factor of insulators by a bridge arrangement has been suggested as a possible method not only for the measurement of porosity but also as a basis for acceptance tests. This method, while giving an average value for an insulator as a whole, will not pick out the individual flaw, which is of course the region of possible failure.

An extensive experimental investigation of the effectiveness of using extremely fine cement, conducted along the same line as the experiments, the results of which are given above, is needed. It is thought that the added advantage gained by the use of such cement will offset the increased cost of its production.

[2]The Reluctance of Some Irregular Magnetic Fields, John F. H. Douglas, p. 1067 A. I. E. E., Vol. 34, Part 2.

[3]Proceedings of the American Institute of Electrical Engineers, November, 1917.

A PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(The recent report of the Joint Committee on Inductive Interference, the result of five years' investigation of this problem, is one of the most important achievements of recent years. The subject involves features of such highly technical and specialized nature, however, that there are many even among electrical men who have felt that the report held little of interest for them. This treatment of the subject in a simple and understandable way by an engineer who is connected with the Pacific Telephone and Telegraph Company, and who served as technical investigator with the Joint Committee, should prove of great value. The article is the first of a series which will deal with various aspects of the problem.—The Editor.)

An impression seems to prevail that the subject of inductive interference is hopelessly involved in complicated mathematics, and that an ordinary electrical man has no hope to comprehend it. This is an unfortunate and wrong idea. Most of us have a conception of the working of a transformer (often called

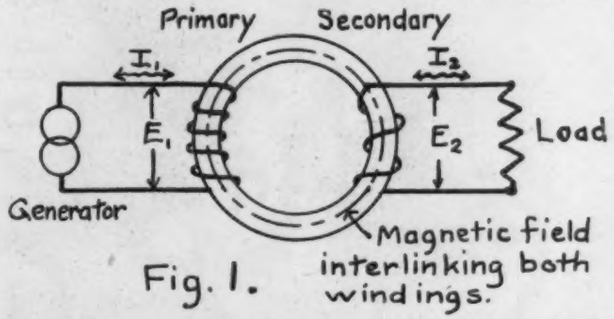


Fig. 1.

an induction coil or a repeating coil), but very few become familiar with the complex relations among dimensions, amounts of copper and iron, efficiency, regulation, cost, etc. In like manner, one need not master the mathematical theory of inductive interference in order to appreciate its character.

Consider a simple example. A telegraph line which runs parallel to a single-phase trolley line is disturbed by "induction." Let us at first pass by the disturbance due to the presence of the electric charge on the trolley wire, due to its potential difference from ground, and consider now only the disturbance due to the current which flows in the circuit when a trolley car is being supplied with energy.* This current traverses the generator, trolley wire, car wiring, motor, and rails (on earth). The inductive effect of this trolley current on the nearby telegraph line takes place in exactly the same way that energy is transferred

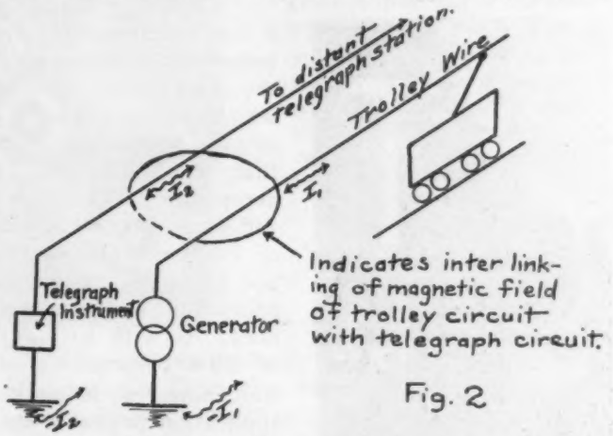


Fig. 2

from the primary to the secondary of a transformer. In Fig. 1 is shown, schematically, an ordinary transformer. A current I_1 is driven through the primary by the generator, at voltage E_1. This current sets up a magnetic field in the core, which interlinks with the secondary winding. The variation of I_1 changes the magnetic field through the secondary, inducing an electromotive force E_2 in it. The secondary being closed through a load, a current I_2 is set up. Power transformers are so designed that, approximately, the primary and secondary voltages are proportional to the turns on the two windings, and the currents I_1 and I_2 are inversely proportional to the number of turns.

In the case of the trolley circuit and parallel telegraph line, there is only one "turn" or loop. The trolley circuit is, of course, the primary "winding," and the telegraph circuit the secondary. Fig. 2 illustrates the relations. The magnetic field due to the trolley current interlinks with the loop composed of the telegraph wire and earth and, the loop being closed through the telegraph instruments, the variation of the trolley current sets up a current in the telegraph circuit, just as in the case of the ordinary transformer.

The simple relations of primary and secondary voltages and currents described above do not hold, however, since in this case there is no appreciable effect on the trolley circuit (the primary) whether the telegraph circuit is opened or closed. This results from the very small degree of coupling of the two circuits.

The frequency, or rate of variation, of the induced current in the telegraph circuit is the same as that in the trolley circuit, just as an ordinary transformer does not alter the frequency. When the induced current in the telegraph circuit approaches the telegraph signalling currents in frequency and amount, the interference becomes serious.

*A third cause of disturbance is that part of the trolley current may follow the telegraph wire as a "return" path instead of the rails on earth.

THE MAKING OF AN AEROPLANE

(The giant forests of Oregon must supply the great bulk of spruce necessary in the manufacture of aeroplanes. This wood, which is used for the entire framework of the machine, is found only in certain favored localities, of which Oregon furnishes the major supply. The converting of the raw product into machine parts is, therefore, the typically Western end of the manufacture, although some factories which turn out the machines complete are also located on this coast. The story of the part electricity plays in this manufacture is here interestingly told.—The Editor.)

THE MAKING OF AN AEROPLANE

Shipping the spruce to market

THE war has brought many industries into being on the Pacific Coast, of which perhaps none is more interesting than that of the making of aeroplanes. The O. K. Jeffery Airplane Factory of Portland, Oregon, is one of these new enterprises built to meet a war need. As with so many of the by-products of war, however, it has its application to peace—for the developments of the future promise a more extensive use of aeroplanes in the commercial life of the world and an ever-growing demand.

The factory is electrically operated throughout, the spruce being sawed into shape by electrically operated saws and turned and planed and polished by electricity. Aside from the present equipment in machinery and lighting, the company is planning extensive additions. The following tabulation of power equipment shows how vital a part electricity is playing in the production of our aeroplane fleet:

Electric Power Equipment

One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—air compressor.
One 5 horsepower, 220-volt, 3-phase, 60-cycle induction motor—wood lathe; sander.
One 5 horsepower, 220-volt, 3-phase, 60-cycle induction motor—band mill; jointer.
One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—mortise machine.
One 7½ horsepower, 220-volt, 3-phase, 60-cycle induction motor—sander; shaper; boring mill.
One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—cut-off saw.
One 15 horsepower, 220-volt, 3-phase, 60-cycle induction motor—two planers.
One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—emery wheel; drill press.
One 25 horsepower, 220-volt, 3-phase, 60-cycle induction motor—blower.
One 10 horsepower, 220-volt, 3-phase, 60-cycle induction motor—elevator.
One 10 horsepower, 220-volt, 3-phase, 60-cycle induction motor—rip-saw.
One 7½ horsepower, 220-volt, 3-phase, 60-cycle induction motor—cut-off saw.
One 50 horsepower, 220-volt, 3-phase, 60-cycle induction motor—planer.
One 25 horsepower, 220-volt, 3-phase, 60-cycle induction motor—future additions.
There are eleven circuits of lights.

The factory is now engaged in turning out complete wooden parts far various airplane manufacturers who are supplying the government with machines—the Curtis Company, the Standard, and the California Aviation Company.

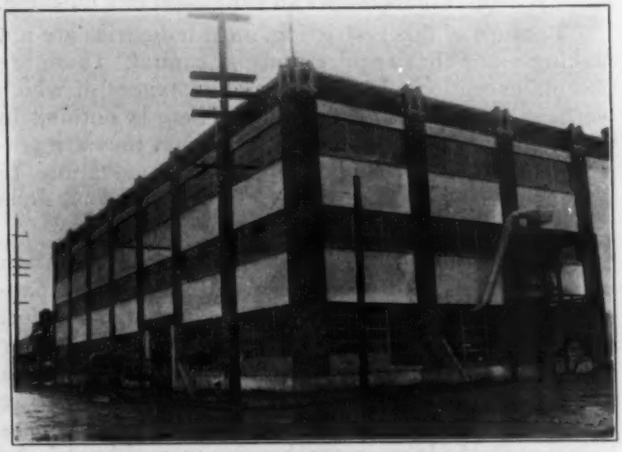
WHERE THE TIMBER IS CUT
A giant logger in the Cochran Mountains taking out spruce and cedar logs.

AEROPLANES AS THEY GROW
White cedar (the tree to the right) and the spruce, which is shown at the left, are both used in airplane construction. Only the most perfect trees can be used.

THE MACHINE

Small contracts for finished aeroplanes are let by the government in the West, but the great contribution of the country this side of the Rockies is in the wood itself and its conversion into the airplane parts to be shipped East for assembling. Several complete machines are now under process of manufacture in this plant.

All parts are manufactured from select spruce, in accordance with government requirements, and comprise beams, struts, webs and engine beds. Pontoons are also built for seaplanes, and, although the company has no contract in this particular, it now is negotiating with Eastern factories to construct seaplanes for the Navy. These hydroplanes or seaplanes will be constructed completely at the local factory, ready for the installation of the engine, which the government furnishes in all cases.



WHERE ELECTRICITY PLAYS ITS PART

Exterior view of the O. K. Jeffery Airplane Factory, Portland, Ore. Note the absence of chimneys—the machinery throughout is run by electricity.

The factory has produced one complete plane and is working on two more, although the bulk of its efforts is directed toward the manufacture of spruce parts for Eastern factories. One of the planes now under construction is a flying boat, an actual hull, designed exclusively for use on the water.

Mr. Jeffery has been granted authority from the government to operate on the construction of spruce parts for airplanes, and the factory is turning out a standardized product of the first quality. Permission was made necessary when the government assumed control of the spruce situation, and only authorized factories are permitted spruce wherewith to carry on their work.

There are many American spruces, but the species in demand is Picea Sitchensis, or Sitka spruce, found on the Pacific Coast from Northern California to Alaska, and reaching its best development in Oregon and Washington.

Oregon has perhaps 60,000,000,000 feet of this species, but little is in pure spruce forests easy to reach. Of the 250,000,000 feet of spruce which has been produced annually in Oregon and Washington, perhaps 15 per cent is suitable for aircraft purposes, which demand not only freedom from knots, sap-pockets and like defects, but absolutely straight grain and a growth not more rapid than six annual rings to the inch. Even the best logs yield only a portion near the outside of such material; many yield none.

A single defective curve would disqualify the timber, for on that slight imperfection might hinge the victory or defeat of an American flier in combat.

The location of an airplane factory at Portland, Oregon, is ideal in that it is situated in the center of the spruce supply not only of the United States, but of the world as well, at present.

THE ENGINEER

BY THEODORE A. LEISEN

When the earth was young and our race was crude,
And the needs of the world were few,
The man of skill found no place to fill;
There was nothing for him to do.

But time in its steady, unceasing whirl,
Wrought changes both far and near,
And the wants of man grew by span and span,
Making work for the engineer.

And so year by year and from age to age,
With the growth of wealth and thrift,
There arose a demand for the skillful hand
Of the man of mechanical drift.

As science and craft and the useful arts
Increased in scope each year,
Came a call for the man who could build and plan,
And they called him an engineer.

CONSERVING LABOR IN A JOBBING BUSINESS

BY E. J. WALLIS

(It is only when the necessity for economy comes that we realize how much we spend. The jobber, with the rest of the nation, faces the need and the duty of conserving labor. How this may be done in many little ways and in a few big ones is here pointed out in an inspiring article. The author, who is Pacific Coast manager with the Western Electric Company, recently spoke eloquently on this subject before the Pacific Coast Supply Jobbers at their Del Monte convention.—The Editor.)

It may be that as a by-product of the war we can make progress toward that jobbers' ideal, when he will cease to quote any price on one of some penny thing for which a proper jobbers' quantity should be established. Perhaps the original wholesale grocer would not have refused to open a can of sardines and ship one greasy fish. Certainly if he were conscientious, he would not refuse an order for one when he had quoted case lots at $40.00 per case, dozen boxes $3.60 per dozen, less than dozen boxes 35c per box, less than a box 5c apiece.

And while we see the value of the promotion of standards, why not think about what might be considered standard service. We have all seen such claims as this: "We ship the same day we receive the order." Many of us have made such claims, and are honestly making that sort of effort. But is it fair to ourselves or the buyer to represent that sort of service as standard service. Is he not induced to expect a service that cannot be given him by any producer or distributor of electrical apparatus, specialties or some supplies? The value of so-called standard service would be largely uniformity. If a buyer knows that his order will be shipped promptly and his routine order is placed sufficiently in advance of his requirements, as it should be, he will receive service that should satisfy his demands, and it will be a service that will not be a strain or an extravagance on his supplier.

The large retail merchants have been quick to recognize the opportunity to reduce gratuitous accommodation and reasonable restrictions on the return of goods have been introduced. In the electrical trade, while we have not been free we have been at least liberal in sending out samples and specialties for a period on loan. It is apparent that each case carries with it a demand for a certain amount of supervision and effort that we may be sure that our property is returned or billed and paid for. To the extent that this practice is useless we may try to introduce reasonable restrictions.

We can only hope to suggest some of our opportunities for office and warehouse economies, and it is more important that we get the right point of view than to attempt to catalogue each and every chance that may be open to us.

The character and expense of a sales department in a supply jobbing business is determined as a judgment of the executives of the business, and without doubt the most important and difficult judgment that must be made for the business.

The foundation of the decision will be the amount or volume of sales to which the business aspires, and the ever-present incentive for an expanding business. In forming this judgment certain important considerations will be given due weight. Any given volume of business demands a suitable financial support, and an ambition for an expanding business will be accompanied by the financial ability to realize on such ambition. Most industries at this moment are experiencing some difficulty in acquiring the needed capital for their ordinary affairs.

There is much talk now of a governmental supervision of capital investment, and it is said that those seeking to make large investments at this time are laying their plans before government authorities for criticism and endorsement, and it is expected that the Administration will ask Congress for authority to license private investments in order that no other need may compete freely with the national needs. We understand that in England supervision is extended to such minute details of private enterprise as painting a house or building a fence. That is a phase of a conscription of wealth generally accepted as less restrictive than the conscription of men. It is clearly a patriotic duty, therefore, to justify the absorption of additional capital that follows an expansion of a business.

Because of this restriction, most industries are not making plans that require unusual capital. There are notable exceptions, but under circumstances of which we have a general appreciation. There is nothing in the attitude of our banks to indicate that they are prepared to extend cheerfully larger accommodations to the jobbing business that sees in present conditions an opportunity to undertake a grand expansion.

But if capital conditions require no consideration or are justified, the man-power necessary for expansion may occasion reflection. That any man can feel sure that he will be free to dispose of his services for the next several years as he has done in the past is a proposition open to some debate. For a very large class the question has been answered, and we may expect that methods so comprehensive may ultimately be established as to insure for government service any man whose experience and skill are needed. With so considerable an amount of work that must be done, it is to be hoped that the men who can do that work will be set at it. And further, those of us who are engaged in a business however important, but still remote from anything like direct participation in war supply production, can expect that the desire to be of the greatest service will urge even the most settled and experienced men in the normal industries to seek greater satisfaction and perhaps compensation in those industries that are the products of our emergency.

The decision to seek an expanded business must make provision for success from increased demand by adequate stocks of merchandise. The buying of stocks ordinarily affords opportunity for selection. Purchas-

ing normally is a picking and choosing, but it has been some time since a buyer has exercised his function in just that way. He has been doing more begging, arguing and scolding, only to be confronted after he had ordered, with unprecedented conditions of transportation that interjected further uncertainties into his calculations. It is only the gambler who sells these days something that he has not previously arranged to buy, and from the most substantial and reliable producers. With reference to speculative buying, it is to be expected that some people will endeavor to secure even the essential raw products, notwithstanding government control, entirely on speculation. The government is prepared to deal with such cases, but business has the opportunity to assist in the prevention of such speculative buying whenever it is detected.

But if it be certain that capital, men and merchandise will be at our disposal, the desire for expansion gets all its color from the expectation of profits, and the latter, to be existent, will have to withstand the attacks of an advanced cost of doing business from increased wages, railroad fares, taxes, stationery, postage —everything, in fact, except so far, light, electric power and telephones. And in addition, profits must afford some reserve against the day of a reduction in price of some of the merchandise which we are sure to have on hand when declines in prices occur.

The amount of our sales promotion expense will depend on our ambition with respect to the desired volume for our business, and that volume is really our opinion of what is our proper proportion of the total possibilities of our territory. The possibilities of business, of course, follow general development, and general development today we find has responded to the same general considerations which we have sketched with regard to the circumstances of an expanded business.

The scarcity of men, money and materials, together with hazards to profits, account for the restricted general development which we observe in new buildings and extension work by central stations and telephone companies. If the determination is reached to attain a greater volume under such conditions, a larger per cent realization on the possibilities is, of course, necessary. It is well to keep in mind that a large per cent realization on available business is possible even with a decreased volume of business. If this is not appreciated an increased and unproductive sales promotion expense may be incurred on the supposition that we are losing our share, when the contrary is the true condition.

The extent to which a jobber will incur sales promotion expense will also depend on the amount and character of the service he figures he can profitably give a manufacturer by introducing new lines, novelties and specialties. Most electrical specialties are labor savers, and as such can be introduced as an answer to the labor problem. But those devices that are not labor savers or those articles that expect a market only to the extent that they can displace some older and more standard device, will probably be classified as luxuries, and the buying public is now being educated against any but justifiable and necessary expenditures.

It would seem apparent that our present circumstances affect some of the considerations that generate sales exploitation expense. Under ordinary circumstances, our reflections on such influences as we have described would be considered at least pessimistic, but it is indicative of the right spirit that we can view our affairs in such light with a feeling that we are approaching some comprehension of a duty and its responsibilities.

In conclusion, we can all agree that this is a very opportune time to reaffirm our allegiance to the code of business ethics so well appreciated in this association; that we will continue to adhere to such principles because they are substantiated by considerations of real economic value.

WAR SERVICE OF WESTERN UNIVERSITIES

BY CHARLES G. HYDE

As an illustration of what a single institution may be called upon to do, here are some of the special things that have been or are being done at the University of California in connection with the war—a record characteristic of Western institutions:

1. From our graduate and undergraduate body, upwards of 2300 men, of whom 1600 were undergraduates, have already responded to the call to active service in the army and navy, such that for each one a star may be set in the service flag of the University.

2. From the faculty upwards of 75 men have already left to take up a varied service in behalf of our country.

3. The University is conducting a ground school of military aeronautics in which 800 men are now enrolled and into which 100 men per week are entering. A new class enters as a class graduates to the flying school each week.

4. Naval preparation courses are being conducted for men preparing to enter the United States Navy with the expectation of taking examinations for commissions in the line or in the engineer division. This course was inaugurated on January 15, and already upwards of 125 men are enrolled.

5. Navigation courses are being regularly conducted for enlisted men detailed from the Naval Training Station on Goat Island and for men intending to enter the merchant marine. These courses are being given both in San Francisco and Los Angeles. Three hundred men have already received instruction therein. Hundreds of other students are in prospect.

6. A training school for men required in certain branches of the ordnance department has been organized and conducted for some months. Large numbers of men have been detailed to this training.

7. Courses in wireless telegraphy, telegraphy, gas engineering, military mapping and sketching and various other subjects have been introduced to meet immediate needs.

8. The Academic Senate has authorized a course in military engineering, a curriculum for which is now substantially outlined. Men taking this course will be especially equipped to enter the Engineer Corps through competitive examination, as provided for by law.

9. Consideration is being given to the project of developing at the University a course in naval training virtually paralleling that now in force at the Naval Academy at Annapolis. More than 80 per cent of the work now given there already appears in the various University curricula.

10. The University, through its various laboratories, particularly in chemistry, agriculture and civil engineering, has undertaken research and testing work of great value and significance and devices and apparatus have been designed which will doubtless prove of very real use in connection with the present struggle.

11. The establishment of a Bureau of Military Information.

CAMP KEARNY ASSEMBLED

The providing of water, light and heat for the housing and feeding of this multitude was a task which was accomplished in something like a month.

THE CONSTRUCTION OF CAMP KEARNY

BY AUSTIN ADAMS

(The building of a city of fifty thousand, not by gradual growth from the small town stage, but overnight as it were, upon the desert, presents problems in engineering and electrical construction of particular interest. Camp Kearny is one of the most successful of the National Army cantonments, and the story of its growth as recorded here, is one of real achievement. The author is familiar with the actual construction problems met with by the San Diego Consolidated Gas & Electric Company in connecting up the eleven or more miles of wire necessary to serve the camp.—The Editor.)

No longer ago than last August, Linda Vista, California, was just a flag station on the Santa Fe Railway, at the top of the long zig-zag Soledad grade, north of San Diego. The population of Linda Vista and the surrounding mesa for miles consisted principally of half a dozen half-breed Chollo section hands, coyotes, cotton-tail rabbits, and quail (in season). Today, however, Linda Vista has a population of thirty thousand men comfortably established in a scientifically sanitary and scientifically arranged community—"with all the modern conveniences." Truly a miracle of engineering, this creation of Camp Kearny as it is today, from the sage-brush desert it was last summer.

When it became known that the War Department was seriously considering placing one of the great cantonments in Southern California, the "live wires" of San Diego got busy. They offered to meet the government more than half-way, by promising to connect the proposed cantonment with the basic necessities of water, light, heat, transportation, and telephonic communication, if the camp were located on the immense table-land of rolling country some fifteen miles north of the city. After a careful investigation of this and other proffered localities, the Secretary of War finally decided on Linda Vista mesa. San Diego rushed preliminary operations so that the city's end of the herculean task would be ready ahead of time. And the War Department started the ball rolling by turning over the enormous works to the Hampton Construction Company, which instantly mobilized an army of between 4,000 and 5,000 workmen, of all the required trades, housing and feeding them right on the ground.

Thus a good sized town sprang into existence, as it were, over night; and the wilderness rang with the beat of hammers, the scraping of saws, and the boom of blasting. And outward from San Diego came the gangs laying water and gas mains, stringing telephone and electric light wires, and grading the new direct highway to the camp. In about a month, when the troops began to arrive, everything was ready for them. The contractors, the city, the local public service corporations, had made good.

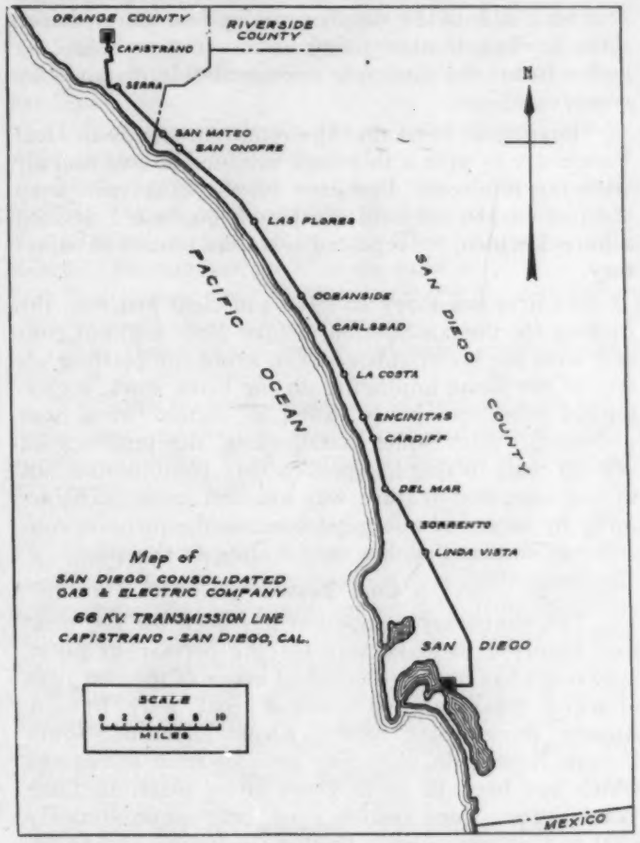
Camp Kearny, where the 40th Division of the new army is now being trained, comprises some 12,721 acres of land leased from the city of San Diego and a number of individual owners, at a nominal rental. The camp proper is 8,000 feet long by 3,000 feet wide, the quarters for the various units being built about a central drill ground as flat and level as a billiard table. Close by is the base hospital, of the separate unit type, provided with beds for 500 patients and equipped with absolutely the latest and best appliances known to science. Two miles away is the remount station, where about 10,000 horses are collected and trained before being shipped for service elsewhere. There is a post-office with several daily deliveries; a complete telephone exchange; a number of Y. M. C. A. and Knights of Columbus buildings; and a "Coney Island," which is being developed just outside the camp, where the men will find all sorts of wholesome amusement provided by concessionaires under strict military supervision.

Sanitation was of course the first thing to be thought of, and an idea of the task may be gathered from the following figures. Two distinct sewer systems, each discharging through a septic tank into a remote canyon, provide the necessary drainage for this city of 30,000 population. The camp proper required 39,000 feet of sewer pipe; the hospital 6,000 feet; and the remount station 4,000 feet. Practically every yard of these 49,000 feet of trenches had to be blasted out because of the nature of the ground, an impervious cemented gravel conglomerate formation.

Water is furnished by the city of San Diego, whose source of supply of pure mountain water is in a series of reservoirs some twenty to sixty miles away. A receiving reservoir at the camp, with a capacity of 1,762,000 gallons, distributes the supply to the mess kitchens, lavatories, etc., through some

fifteen miles of mains; ten miles in the camp, three miles for the remount station, and the balance for the hospital. The elevation of the reservoir is 523 feet above sea level.

There are four and one-half miles of paved streets in the camp, the paving being 20 feet wide and from 5 to 8 inches thick; and in addition to these, there are over nine miles of new roads on the cantonment, 26 feet wide and surfaced with disintegrated granite. The Santa Fe Railway has run a branch line from Linda Vista to the heart of the camp, a distance of two miles,



THE POWER LINE WHICH SERVES THE CAMP
Linda Vista was located in the desert, with not even a power line extending to it, no longer ago than last August.

and built a very large and commodious station, whence a regular train service is maintained—with enormous business, needless to say, in carrying the "liberty" men to and from San Diego.

The San Diego Consolidated Gas & Electric Company supplies Camp Kearny with light and heat. Just what this double installation means will be appreciated after a glance at some of the figures given below. To reach the camp an 11,000 volt line eight miles long was built to Linda Vista, requiring 111 poles 50 feet high; a branch line from Linda Vista to the camp, three and one-half miles long, requiring 55 poles 40 feet high; and (in order to guarantee continuous service) a tie line four and one-half miles long from the company's La Jolla-Del Mar line. Nearly all pole holes had to be shot with dynamite. The total amount of copper in these three lines was approximately 34,000 pounds. At the camp there was erected a 600 kilowatt substation, stepping down from 11,000 to 2,300 volts, for local distribution. On the cantonment there are some thirteen miles of lines, requiring 876 poles; 951 service drops; 20,000 Mazda lamps for interior lighting; 404 100-candlepower street lights; a 200-horsepower pump at the camp proper; and a 100-horsepower "booster" pump on the pipe line connecting with the city mains. Every building and every one of the thousands of tents is supplied with electric light; and electrical power was a potent factor during the phenomenally fast construction of the camp.

The gas (with which all cooking is done) is supplied through a high pressure main thirteen and one-half miles long, and within the cantonment there are some ten miles of mains of smaller diameters. The maximum capacity of the 10-inch service main is 150,000 cubic feet per hour, and practically the entire line is welded together by the oxyacetylene process. Two Westinghouse positive oil meters, located at the southerly edge of the cantonment, will measure the supply of gas, which at present (December, 1917) is about 20,000,000 feet per month for the 300 services in the camp. Taking time by the forelock, the San Diego Consolidated Gas & Electric Company got its construction gangs into the field with such promptitude that by August 5th the gas in the mains reached the cantonment.

The climate of San Diego is so mild and equable that troops located here would have twelve months in the year for active out-door work uninterrupted by extremes of cold, heat, or stormy weather. This fact, together with the strategic importance of the location, at one corner of the national arena, has disposed the government to make this cantonment a permanent military base.

A CITY IN THE MAKING
The picture shows a Western camp in the process of construction. Kearny was one of the first camps ready, and has one of the cleanest records for health conditions.

POWDERED COAL FOR CENTRAL STATION USE

BY W. J. SANTMYER

(The shortage of fuel is making necessary the utilization of lower grades of coal, as well as the more efficient consumption of the coal now in use. A series of experiments carried on by a Puget Sound power company indicates that the use of powdered coal meets both these needs. The author, who is on the engineering staff of the Puget Sound Traction, Light & Power Company, has recently spoken on this subject before the lumbermen of the Northwest.—The Editor.)

The present fuel situation is such as to require the closest attention in order that there be no interference with industrial or domestic demands. Fuel oil has reached a prohibitive price, and even at that is practically unobtainable. This condition has resulted in a greatly increased demand for coal, which will probably tax both the mines and transportation facilities to their utmost capacities.

There are two ways of meeting this situation: by utilizing grades of coal previously wasted; and by getting higher efficiency from the coal burned.

As previous experiments and experiences indicated the feasibility of burning pulverized coal, that method presents itself as a possible solution. The theory of combustion strongly supports this plan. With powdered coal, it is possible to obtain an even, thorough and intimate mixture with air which results in a minimum of excess air and complete combustion.

It was about the first of 1917 that a series of experiments were begun in burning powdered coal in a 300 h. p. Babcock and Wilcox boiler in the Western Avenue station of the Puget Sound Traction, Light & Power Company, which were in intermittent progress some seven months. The results warranted the purchase of pulverizing mill, dryer, and all other equipment necessary for the complete installation of powdered coal plant for 2400 h. p. of boilers.

Before discussing the results of these experiments, I will outline the steps in the preparation of the coal. If not already to size, the coal is crushed to three-quarters inch and then fed into the dryer. The degree of dryness required to prevent any cohesion of the particles which would interfere with pulverization varies from 1 to 6 per cent, according to the form in which the moisture occurs in the coal.

Likewise, the fineness necessary to allow complete combustion while the fuel is still suspended is somewhat dependent on the character of the coal. With our lignites and sub-bituminous coals, which have a high volatile content and high fusing point of the ash, a less fine degree of pulverization is permissible than with coals having a greater proportion of fixed carbon. To get the best results our local coal should be ground up so that 95 per cent will pass through a 100-mesh screen and 85 per cent through a 200-mesh. However, we got good results with considerably coarser coal.

There is a rather prevalent opinion that powdered coal is extremely dangerous to handle, but experience has clearly proven that with reasonable precaution there is no likelihood of explosion or spontaneous combustion.

To transport the pulverized coal from Briquettville to Seattle, a box car was equipped with metal lined hopper so as to be air-tight and prevent the absorption of moisture. The coal was discharged into an enclosed conveyor which elevated and dumped it into the bunker. From the bottom of the bunker the coal was fed into the supply pipes by two motor-driven screws. The bunker being about 30 feet from the boiler front, the coal was conveyed this distance by compressed air.

Bearing in mind that the requirements of an ideal burner are to give a thorough mixture of coal and air with the minimum discharge velocity that will keep the fuel suspended until completely burned, I devised a burner which, by repeated test, has proven satisfactory.

As it is necessary to have sufficient space in the furnace for the combustion to take place without contact with the boiler tubes and to avoid the blasting effect of the flame impinging on the brick work, an extended oven, commonly called a "Dutch" oven, was provided. With some installations, the tendency of certain coals to slag has proven very troublesome, but in our case that feature was handled most satisfactorily by means of a slag pit beneath the furnace, constructed so that the slag cannot cling to the sides.

Coal Tested

The temporary equipment has been for the most part removed to make way for the permanent plant, but record has been preserved of many of the test runs in which representative kinds of coal were burned. Among these coals were: Black Diamond, South Prairie, Newcastle, including samples from screenings which had been 10 to 15 years under water in Lake Washington; Tono, which runs only approximately 8000 b. t. u. per pound; Renton, including sludge off the dump which in raw state analyzed over 21 per cent ash and 30 per cent moisture; and samples from California and British Columbia.

A Representative Test

In the following, I am giving a record in brief of a representative test:

Test of 300 H. P. B. & W. Boiler Burning Powdered Coal
Western Avenue Station, May 9, 1917

	Total or Average
Duration of trial	14 hrs. 38 min.
Water by Venturi meter	169,500 lbs.
Temperature of water	186° F.
Water evaporated, actual	166,960 lbs.
Temperature of steam (209° C.)	408° F.
Steam pressure, gauge	116 lbs.
Temperature due to pressure	347° F.
Superheat	61° F.
Factor of evaporation	1.1
Weight of coal	21,820 lbs.
Evaporation per lb. of coal—	
As fired	7.64 lbs.
From and at 212° F.	8.42 lbs.
Draft in uptake in inches of water	.27
Draft in mixing chamber	.208
CO_2 by recorder	13½ per cent
Boiler horsepower	415
Flue gas temperature by pyrometer	475° F.
B. T. U. per lb. of coal, raw	9449
B. T. U. per lb. of coal, powdered as fired	10,967
Efficiency	75 per cent
Kind of coal	Renton Buckwheat

Coal Analysis

	Raw	Drier	Powdered
Water	15.20	7.11	5.44
Volatile	39.14	42.68	45.32
Fixed Carbon	32.10	37.32	35.57
Ash	13.56	12.89	13.67
	100.00	100.00	100.00
Sulphur	.37	.42	.39
B. T. U.	9,449	10,862	10,967

Results of Tests

The results of our series of tests with powdered coal may be summed up in brief as follows:

It was found that different kinds and grades of coal could be prepared, transported, stored and burned with the same equipment, without physical difficulty.

That low-grade coals that cannot be burned efficiently in any other manner gave good results in the powdered form.

That higher efficiency was obtained than with any other means of combustion.

That the powdered coal fire proved remarkably flexible, it being possible to force the boiler to 200 per cent of rating in a few minutes without any apparent injury to heating surface or brick work.

That it was easy to operate, requiring but little attention, and thoroughly dependable.

That the fire was smokeless even under heavy overload.

That the increased capacity of boilers with pulverized fuel means less investment and hence a saving through lower fixed charges additional to that due to greater efficiency.

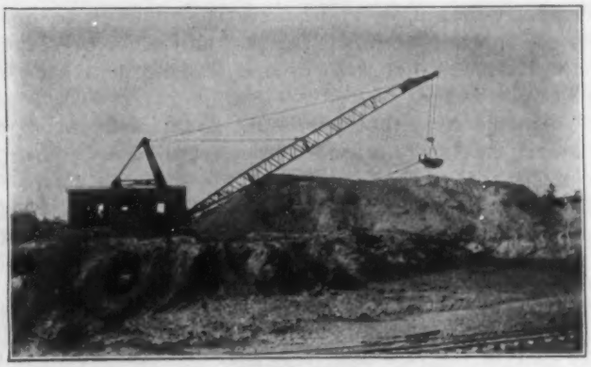
Cost of Preparation

While our experience with powdered coal is yet too limited to speak authoritatively on the expense of preparation, the cost would probably be from 30 to 60 cents a ton, depending on the quantity handled at the plant. At this figure you can see there would be considerable differential favoring pulverized fuel. In working out the equivalent costs of various fuels for any special case, careful consideration should be given the advantages previously mentioned.

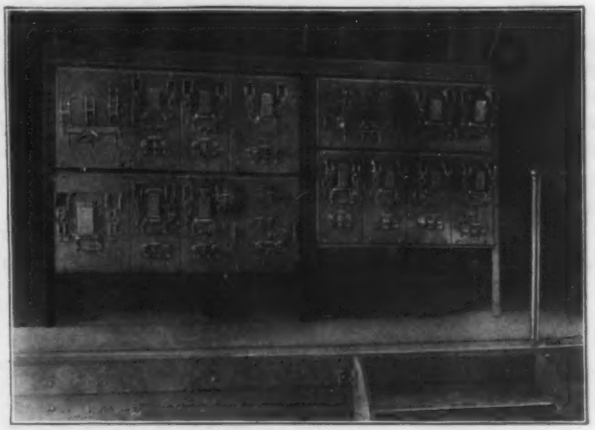
ELECTRIC CONTROL OF DRAG LINE EXCAVATOR

BY. L. W. NICKEL

One of the most interesting applications of electric control in a field where reliability is essential can be found in the electric control of a drag line excavator used for stripping coal beds. The rock is drilled by steam drills and shot when encountered in the stripping process. In one position with this drag line it is possible to take a cut of 150 feet wide. Spoil banks are always dropped on surface which does not contain coal, that is, the excavator is always placed directly over the vein and followed by a steam or electric shovel. The drag line method of stripping coal beds has found favor with mining engineers, inasmuch as it is much cleaner than any other method, as no rock or dirt can be spilled on coal when once cleaned, as is the case when it is necessary to run locomotive track for hauling rock and dirt which is taken off the surface.



The excavator at work



Central panels for the electric drag line excavator

Electric control of a drag line is preferred because no fireman is needed, no coal passer and no pipe man. Further, there is no water pipe to freeze up, and on the coldest mornings no delay is necessary to start the stripping operation, it merely being necessary to close the main line switch and start operation.

This drag line excavator has a 24-foot diameter turn-table, 150 horsepower hoist motor, and 75 horsepower swing motor. The swinging machinery is operated by a 75 horsepower, 440-volt, type slip ring motor, driving a vertical swinging shaft by means of three gear reductions. A pinion on the vertical shaft engages the swinging rack on the base.

The main machinery is driven by a direct-geared 150 horsepower, 440-volt, slip ring type motor, operating at a speed of 565 R. P. M., and includes two drums, one of which winds the rope by means of which the bucket is dragged through the dirt, and the other operates the rope by means of which the bucket is hoisted. There is also a small drum for the purpose of manipulating the rope by means of which the boom is lowered and raised. The master controllers, brake levers, etc., are all mounted at the front of the machine facing the boom, at which point the operator can operate the machine without danger to the pitman.

The power for this installation when brought to the drag line system, is three-phase, 440 volts, 60 cycle. The current is commutated to the machine by means of a collector ring equipment consisting of three copper rings mounted concentric with the center casing of machine, which revolve with the same. Heavy brass brushes are anchored on the machine, to which the cable is attached, there being two brushes for each phase. The control of this drag line excavator illustrates the tendency, on the part of mining operators, to adopt electric driven machinery.

SHORT JOURNEYS IN PACIFIC LANDS

(Traveling in the Orient sounds to the uninitiated as though it might prove a precarious adventure—but in reality it means only traveling in somewhat greater luxury than that to which one is accustomed at home. With the developing trade between the West and the Orient, a knowledge of hotels and stopping places in Japan and China will prove most useful to the electrical man who looks to the frontiers for expansion.—The Editor.)

HOTEL ACCOMMODATIONS IN JAPAN

The Interesting Miyako Hotel at Kyoto.

A few hours' journey by rail from Osaka brings one to the fascinating city of Kyoto, where so much of the manufacturing work in embroideries, vases, tableware, and the like, are brought to life. Here is to be found the most interesting and fascinating hostelry in Japan—the Miyako Hotel. Its location is fully three-quarters of an hour's ride by rickshaw from the station, but one is amply repaid for the journey.

Situated on a hillside overlooking the city of Kyoto, the Miyako Hotel commands at once a position from which one may acquire an enlarged viewpoint of Japanese life and civilization. The building, built after Japanese architectural design, rambles for some distance along the hillside, thus offering for every room occupant equal advantages for outside air and view. The dining service is charming. Daintily attired in the artistic Japanese costume, the little girl waitresses trip back and forth to serve the guests with truly Japanese art.

In the garden of the Miyako Hotel at Kyoto

As one enters the long, glassed-in dining room which overlooks the city of Kyoto, the artistic arrangement of the flowers — the fragrant iris, carnation, chrysanthemum, or other grouping of flowers such as is known only to the Japanese artist—catches the eye. The rolling of the napkins, standing upright in each glass upon the table, seems, too, to harmonize wonderfully with the art expressed in the arrangement of the flowers. With such restful surroundings, it is not to be wondered at that the tourist is able to study the processes of manufacture of silks, cloisonne, damosene and other ware with an interest not aroused at any other Japanese city.

The Imperial Hotel of Tokyo

After a delightful overland trip of a day from Miyako one arrives in Tokyo. Tokyo is indeed a fitting climax to a tour of Japan. With what childhood fancy we all have long thought of the home of the Mikado—descendant of the Son of Heaven! The Imperial Hotel, dignified and elegant, is indeed a worthy tribute to the might and power of a nation that has risen to such world eminence in a brief fifty years.

In one hallway leading from the main lobby is displayed in an attractive and dignified manner, by means of glass show cases, the acme of Japanese perfection in silk embroideries, culture pearls, vases, and indeed all of the principal things that have meant so much to Japanese industrial and manufacturing development. The main lobby, on the other hand, is devoted to luxurious furnishings for chats by business men in groupings or for afternoon and evening tea service.

The Imperial Hotel at Tokyo, showing the attractive red and white bordered tag, the stationery and a typical menu

The dining room service, too, is superb. The individual tables have upon them basket-work to hold flowers and unique bowls for jam and other preserves that give a distinct tinge to the leading hostelries of the Capital City.

And so it is that when the American tourist or engineer starts again for his homeward-bound journey he places among the fondest jottings of memory's dearest treasures the recollections of life and activity in the unique and enterprising hostelries of the Far East.

ELECTRICITY IN THE PHILIPPINES

Most of the industries in the islands are using electric current for lighting or power, or both, which has secured greater production and has contributed in a marked degree to the general prosperity of the islands. There are at present two hydro-electric power plants in operation.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(Allowance for depreciation is at best an approximation and is the occasion for endless confusion and complication in the fixing of the rate-base for public utilities. The shortcomings of the generally accepted formulas for such determination are here pointed out in contrast to the more accurate "Unlimited Life Method" by which replacements are treated as though they were repairs on a large scale. The author is a well-known consulting engineer of San Francisco, and an authority on valuation problems. —The Editor.)

THE DEPRECIATION PROBLEM

In an earlier article of this series something has already been said about depreciation and the replacement requirement and about the consideration that should be given thereto when earnings are to be limited by regulation. It has been stated by the author that it is fundamentally sound in principle and is good practice to regard the public utility as an institution or enterprise which has unlimited life (except, of course, in the special case where peculiar circumstances fix a life term) and that so regarded, all necessity for estimating accrued depreciation or the present worth of elements of limited life when rates are to be fixed falls away. This does not mean that maintenance and upkeep may be neglected. On the contrary, adequate provision must always be made to meet repairs and replacements regardless of whether the article which is repaired, perhaps by replacement of some of its parts, is one with a life of a few months only or is ordinarily expected to serve for some years. The principle is always the same. Such things as machinery begin to wear out or to deteriorate from the day they go into use. In the case of such things their present value can be estimated whenever a comparison is possible between the probable life of a new article of the same kind whose cost is known and the probable remaining life of the article whose present or remaining value is to be estimated. This fact makes it possible to estimate accrued depreciation in all cases in which past experience justifies a forecast of probable life new, and probable remaining years of service. But this depreciation in value in no way affects the quality of the commodity which is furnished by the utility nor the quality of service rendered, as the case may be. It is of no aid to the rate regulating authority to know exactly or even approximately what the accrued depreciation is, provided always that the plant in question has not been neglected, that it has been kept in proper condition, that there is no deferred maintenance, and that the service rendered by it is at full efficiency determined by the standard established by the plant itself. In most cases, despite the lessening intrinsic worth of some or all of the elements which make up a utility plant, its service will improve with age. The public acquires confidence; the reliability of and dependability upon the service to be rendered is on a higher plane with an old plant than with a new one.

Needless though it is to take accrued depreciation into consideration when earnings are to be limited by regulation, the requirement under the interpretation of the law by the highest court of our country that the starting point must be fair present value, compels its consideration, because, without such consideration the present value of depreciating elements can not be determined.

Accrued depreciation can only be determined with accuracy when the remaining life is known. This is the rare or exceptional case, as when for some reason, as in the case of a mining camp, the time can be predicted when by reason of exhaustion of the ore-bodies, the camp must be abandoned. Ordinarily both the probable life new and the remaining life for any article in service which is to be valued must be estimated. It becomes a matter of opinion and results can only be approximate. Furthermore, every prediction will be based on probability of failure at some particular time in the future, because it is just as likely that the article will serve beyond that time as it is that the article will fail before that time. The statement has been made in an earlier paper of this series that every calculation based on such premises, even though probable life has been correctly estimated, must give results somewhat in error. The current annual depreciation thus estimated will be somewhat too small, while the present value as determined from the ordinary formulas will be somewhat greater than the actual value.

The mathematical demonstration of these shortcomings of the generally accepted formulas is as follows:

When the probable life of an article was n years when that article was new and its expectancy or probable remaining life is e years, at the time for which current depreciation is to be determined, the current annual depreciation for an original cost of $100 would ordinarily be estimated by the following formula:

$$\text{Current annual depr.} = 100\left[\frac{(1+i)^{n-e}-(1+i)^{n-e-1}}{(1+i)^{n}-1}\right]$$

where i is the interest rate expressed decimally, thus .06 for six per cent.

Or in another simpler form:

$$\text{Current annual depr.} = 100\left[\frac{i(1+i)^{n-e-1}}{(1+i)^{n}-1}\right]$$

Call: $n - e = m$

then the formula may be written

$$\text{Current annual depr.} = 100\left[\frac{i(1+i)^{m-1}}{(1+i)^{n}-1}\right] \quad \ldots\ldots(1)$$

Now suppose that there are two articles under consideration whose expectancy at the time for which the current depreciation is to be determined was e years, but of which one actually went out of use s years before the predicted term of its service and the other served for s years longer than had been predicted. If these facts had been known the current annual depreciation of these two articles would have been expressed as follows:

There would be

$m_1 = m + s$ for the article failing early.

$m_2 = m - s$ for the article failing late.

For the article failing early

$$\text{Cur. ann. depr.} = 100\left[\frac{i(1+i)^{m+s-1}}{(1+i)^n-1}\right]$$

For the article failing late

$$\text{Cur. ann. depr.} = 100\left[\frac{i(1+i)^{m-s-1}}{(1+i)^n-1}\right]$$

For both articles,

$$\text{Cur. ann. depr.} = 100i\left[\frac{(1+i)^{m+s-1}+(1+i)^{m-s-1}}{(1+i)^n-1}\right] \quad \ldots(2)$$

But according to the ordinary method of introducing expectancy into the calculation the current annual depreciation of the two articles would be estimated from (1): For both articles

$$\text{Cur. ann. depr.} = 100i\left[\frac{2(1+i)^{m-1}}{(1+i)^n-1}\right] \quad \ldots\ldots\ldots\ldots(3)$$

The current depreciation as correctly determined by equation (2) will always be larger than that found by the ordinary method equation (3) because:

$$(1+i)^{m+s-1}+(1+i)^{m-s-1} > 2(1+i)^{m-1}$$

In the case of the determination of present value if expectancy be made the basis of the calculation, as is the common practice, the formula for the present value of an article whose original cost was $100 is as follows:

$$\text{Present value} = 100\left[1-\frac{(1+i)^{n-e}-1}{(1+i)^n-1}\right] \quad \ldots\ldots\ldots\ldots(4)$$

Let consideration be again given to two similar articles, the probable life of each of which when new was n years and whose expectancy at the time when valued was e years, and whose history shows that one went out of use s years before its predicted date of failure while the second continued in use for the same number of years beyond this predicted date. These two articles may stand for any number of articles whose actual terms of service will, in part, fall short of and will in part extend beyond the original probable life term, which is the problem for any group of articles all of the same expectancy.

We have again

$m_1 = m + s$ for the article that fails first, and

$m_2 = m - s$ for the article that fails last.

From the above formula:

$$\text{Pres. val. of the first article} = 100\left[1-\frac{(1+i)^{m+s}-1}{(1+i)^n-1}\right]$$

$$\text{Pres. val. of the second article} = 100\left[1-\frac{(1+i)^{m-s}-1}{(1+i)^n-1}\right]$$

Pres. val. of the two articles

$$= 100\left[2-\frac{(1+i)^{m+s}+(1+i)^{m-s}-2}{(1+i)^n-1}\right] \quad \ldots\ldots(5)$$

Determined on the basis of expectancy without regard to the fact that one-half of any number of articles must be expected to and probably will fail before, and the other half after the predicted date of failure, the present value of the two articles would be expressed by: Pres. val. of both articles (ord. formula)

$$= 100\left[2-\frac{2(1+i)^{n-e}-2}{(1+i)^n-1}\right]$$

and because $n - e = m$

Pres. value of both articles (ord. formula)

$$= 100\left[2-\frac{2(1+i)^m-2}{(1+i)^n-1}\right] \quad \ldots\ldots\ldots\ldots(6)$$

But $(1+i)^{m+s}+(1+i)^{m-s} > 2(1+i)^m$

Consequently the formula (5) containing the larger negative term will always give results somewhat smaller than formula (6). By the use of expectancy and ordinary formulas, therefore, the present value would be estimated somewhat too large. Fortunately, the errors introduced by using the ordinary formulas based on sinking fund methods of calculation are not a matter of great importance because the basic elements to be taken into account, the probable life new and the expectancy after a period of service, are approximations based on expert judgment and may be at considerable variance with actual facts.

Here is an additional reason why value should not appear in the rate-base. But even though the necessity of computing accrued depreciation and present value, falls away when rates are to be fixed, the other problem of estimating the replacement requirement is ever present. The replacement requirement is often, though loosely, referred to as offsetting current depreciation. The allowance in the earnings is then referred to as an allowance for depreciation. This allowance thereby assumes the aspect of an amortization of capital to the extent that there has been lessening of worth and lends plausibility to the use of the remaining or present value of physical elements in the rate-base. That this is not necessary for correctly estimating proper earnings has been fully demonstrated by the author in "Valuation, Depreciation and the Rate-Base," and in various papers contributed to the Transactions of the American Society of Civil Engineers and the demonstration need not be repeated here. It is only necessary to say that any money accumulating in a fund for replacements should be regarded as being at the disposal of the utility owner for any purpose and that, theoretically, in so far as the ultimate result is concerned, it would make no difference whether the owner is allowed an interest return on present value plus so-called current depreciation estimated from remaining value and remaining life or whether he is allowed interest on full value new (original investment) plus the replacement or depreciation increment which will in the life term provide the funds necessary for replacement, provided always that the life term of any article in question could be known in advance.

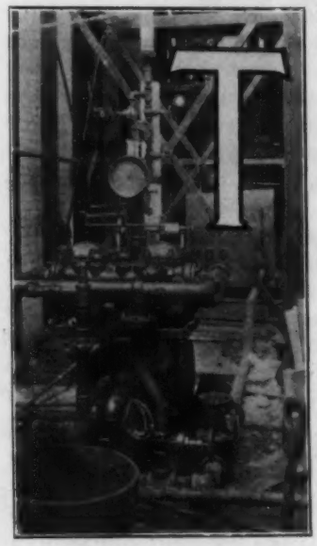
Consideration of this fundamental truth, coupled with the fact that accrued depreciation is not susceptible of precise determination, has led the author to recommend for general application the procedure which he has named the "Unlimited Life Method of Procedure," under which a clear distinction is made between value and rate-base and under which provision for replacements is to be made as required, being treated as though replacements were repairs on a large scale, to be foreseen before the necessity arises to make them, and under which therefore the earnings should be ample to provide a fund out of which either to meet the replacement requirements or to reimburse the owner after they have been made.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(The accurate weighing of water and oil in oil-fired boiler tests is a matter of the greatest importance. The authors, at the invitation of the Power Test Committee of the American Society of Mechanical Engineers, presented their views on this subject before a recent hearing of the committee in New York City held for the consideration of the establishment of a code for the standardization of such tests. Further discussion in these columns by engineers of the West will be welcomed. In this article many other details are set forth, which are being embodied in a book on fuel oil and steam engineering by the authors. This book is now in course of publication and will appear for the trade about April 1, 1918.—The Editor.)

WEIGHING THE WATER AND OIL IN BOILER TESTS



Tank in rear for weighing oil

THERE are various types of commercial water meters and water weighers on the market. Some of these are quite accurate for certain investigations. For boiler performance, however, they are not to be recommended.

Volumetric Method of Water Measurement.— Water may also be measured quantitatively by taking its volumetric proportions. Its weight is then computed after ascertaining its specific density. The reverse of this principle is used, for instance, in measuring the volumetric clearance of a steam engine, wherein water is poured into the cylinder ports when the piston head is at its dead end and the water afterwards drained out and weighed. From the weight of the water so used the volume of the clearance is computed. In rough measurements of engine and boiler performance the water is sometimes measured by filling a tank or barrel of known volumetric proportions, and by keeping account of the number of barrels so filled and dumped into the sump, sufficient data is obtained to compute the weight.

The Method of Standardized Platform Scales.— It is now universally recognized, however, that carefully weighing the water on carefully standardized scales is the only safe and reliable method of ascertaining the water fed to a boiler under test.

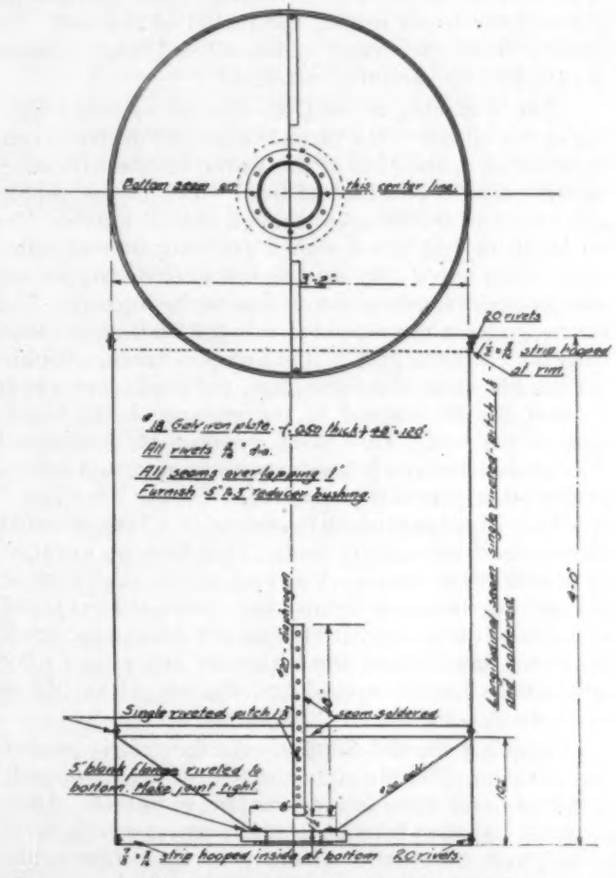
Let us then see how the details are arranged for the weighing of the water used in steam generation.

A large square metallic tank about 5 by 5 by 4 feet in dimensions is usually constructed. From the bottom of this tank all feed water for steam generation in the boiler under test is drawn. At the beginning of the test the water level in this tank is accurately measured by means of a hook gage situated within the tank. At the end of each hourly period of the test and at the conclusion of the test this exact level is also maintained.

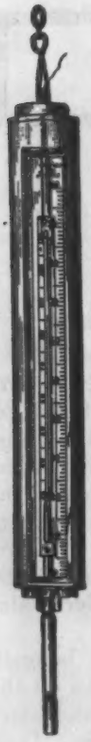
The control for the water supply is accomplished by two or three vertical cylindrical tanks that have a conically shaped outlet at the bottom. These tanks are located on standardized scales immediately above the main supply tank that has just been described. The complete installation is shown in the illustration. At the beginning of the test the height of the water in the boiler is noted on the gage glass in front of the boiler and as near as is possible the feed pump is regulated in its operation so as to maintain this level. At the instant of conclusion the water level is most carefully adjusted to meet the condition of boiler water level prevailing at the beginning of the test.

As the water is drawn from the feed tank beneath the platform scales the operators fill the tanks on the scales above and note the weight before and after emptying their contents into the tank below. Thus with ease the water surface in the tank below may be kept at the constant hook gage reading desired, and the net weight of water fed to the boiler ascertained at any time during the test.

The improvised desk boards shown in the illustration assist materially in aiding the water weighing


Bottom seam on this center line.
3'-2"
20 rivets
1/2 x 2 1/2 strip hooped at rim.
#18 Galv iron plate. T. 050 thick + 28 = 128.
All rivets 1/4" dia.
All seams over lapping 1"
Furnish 2" B.S. reducer bushing
4'-0"
Single riveted, pitch 1 1/2
seam soldered
5" black flange riveted to bottom. Make joint tight
1/2 x 2 1/2 strip hooped inside at bottom 20 rivets.

An Excellent Design for a Measuring Tank



COMBINATION OIL SAMPLER

Samples may be taken at any desired distance from the top by attaching a tape measure, and from the bottom, at a distance of from 1 to 15 inches, by means of a sectional rod which accompanies each instrument; merely screw on rod section of same length as distance from bottom where sample is to be obtained. On the central rod of instrument is fastened a delicate thermometer, so that the temperature of liquid may be obtained at the time of taking sample from container.

WATER INDICATOR AND OIL SAMPLER

This is an instrument for accurately measuring the depth of water that may settle in the bottom of an oil tank, and for drawing a sample of oil or water therefrom. It consists of a square metal tube 12 inches long, with heavy bottom. A scale, fastened to one side by screws, is divided in inches and tenths of inches. Upon the opposite side, and running its whole length, is an adjustable strip of metal controlled by a set of screws, to hold fast the strip of prepared paper, whose function is to show the water depth by having its colored surface removed and made white on that portion immersed in the water, that portion coming in contact with oil only not being affected.

operators to perform their task with ease and without confusion.

In order to prevent wastes and leakages of water, it is well to disconnect the outlets from the blowoff pipes of the boiler during the period of the test. All outlets from the water columns and gage glasses should also be carefully watched.

The Weighing of the Oil.—For the careful weighing of the oil fed to the furnace a similar device is constructed as in the case of the water determination. A metallic tank is constructed from which the oil supply is pumped to the furnace through the oil heater. The oil pump is best fitted with a governor and an automatic relief valve. By this means a constant pressure may be maintained on the oil line to the burners. The discharge from the relief valve is led back to the tank from which the supply to the pump is taken. Within the tank is situated a hook gage, the reading of which is carefully ascertained at the instant of the beginning of the test. This exact reading is maintained throughout the hourly progress of the test, and indeed at any other period if so desired.

This is accomplished by means of a tank situated above the main supply tank. This tank is installed on standardized scales. Previous to the discharge of the oil into the tank below, the scales are read and when the oil is brought to the proper hook gage reading in the tank below, the scales are again read. By subtracting these two readings, the net oil supply is ascertained.

Sampling the Oil Supply.—As the fuel is poured into the tank upon the standardized scales, a dipperful of the oil is set aside in a convenient receptacle. After a sample has thus been obtained from each tank, as it is weighed, the entire quantity is then thoroughly mixed. Three parts of this mixture are then put into separate cans and sealed. One part is analyzed by the party or company for whom the test is being performed, the second is analyzed by a disinterested party, and the third is retained in case of disagreement.

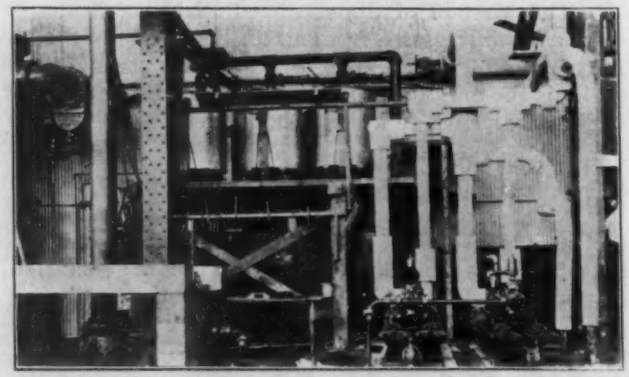
General Sampling of Fuel Oil for Purchase.—The question of determining a proper sample for commercial valuation of oil is one of patient care. The United States Bureau of Mines has evolved careful instructions to accomplish this in their technical paper No. 3, from which the following is largely an excerpt:

The accuracy of the sampling and, in turn, the value of the analysis must necessarily depend on the integrity, alertness and ability of the person who does the sampling. No matter how honest the sampler may be, if he lacks alertness and sampling ability, he may easily make errors that will vitiate all subsequent work and render the results of tests and analyses utterly misleading. A sampler must be always on the alert for sand, water and foreign matter. He should note any circumstances that appear suspicious, and should submit a critical report on them, together with samples of the questioned oil.

Sampling With a Dipper.—Immediately after the oil begins to flow from the wagon to the receiving tank, a small dipper holding any definite quantity, say 0.5 liter (about 1 pint), is filled from the stream of oil. Similar samples are taken at equal intervals of time from the beginning to the end of the flow—a dozen or more dipperfuls in all. These samples are poured into a clean drum and well shaken. If the oil is heavy, the dipperfuls of oil may be poured into a clean pail, and thoroughly stirred. For a complete analysis the final sample should contain at least 4 liters (about 1 gallon). This sample should be poured into a clean can, soldered tight and forwarded to the laboratory.

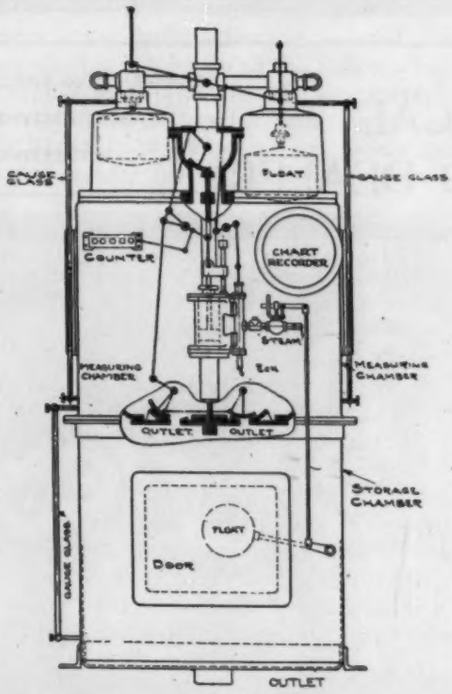
It is important that the dipper be filled with oil at uniform intervals of time, and that the dipper be always filled to the same level. The total quantity of oil taken should represent a definite quantity of oil delivered and the relation of the sample to the delivery should be always stated, for instance: "1-gallon sample representing 1 wagon-load of 20 barrels."

Continuous Sampling.—Instead of taking samples with a dipper, it may be more convenient to take a continuous sample. This may be taken by allowing the



A DESIGN FOR A WEIGHING TANK IN A BOILER TEST

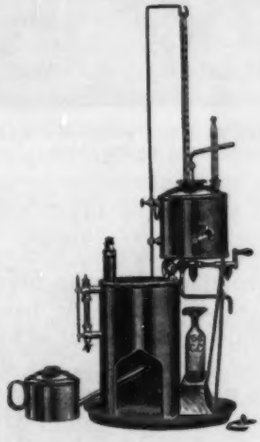
In order to assure the rapid passage of water or oil from the tank upon the flatform scales into the container below, the employment of steel tanks with conical shaped bottoms is most effective. The outlet for the oil or water should be controlled by quick-opening valves.



AN EXCELLENT WATER MEASURER

While the automatic water measurer is not as accurate as the standardized scale method, still it finds many applications in the testing laboratory.

oil to flow at a constant and uninterrupted rate from a ½-inch cock on the underside of the delivery pipe during the entire time of discharge. The continuous sample should be thoroughly mixed in a clean drum or pail, and at least 4 liters (about 1 gallon) of it forwarded for analysis. A careful examination should be made for water, and if the first dipperful shows water this dipperful should be thrown into the receiving tank and not mixed with the sample for analysis.



THE VISCOSIMETER

The design of this viscosimeter is based upon a thorough knoweldge of lubricating oils and of the requirements of manufacture and trade. It is made to meet all demands as a measure of viscosity, and is without the many objections that may be made to all other devices for this purpose. The viscosity of any oil is shown by the number of seconds required for a certain number of cubic centimeters to run through the open faucet. This corresponds to the most generally approved standard now in use by the largest refiners.

LIQUID CIRCULATION POCKET

This device is used in connection with a thermometer for taking the temperature of a circulating liquid —such as water being pumped from the hot well to the heater or boiler; when the main line that carries the liquid is located rather inaccessibly. The pocket is located in a position most convenient for easy observation and, by means of the connections provided an auxiliary line is run to and from the main pipe line.

Mixed Samples.—The all-important point is that the gross sample, whatever the manner of sampling, shall be made up of equivalent portions of oil taken at regular intervals of time, so that the sample finally forwarded for analysis will truly represent the entire shipment.

Water or earthy matter settles on standing. Hence, before a large stationary tank or a reservoir is sampled, the character of the contents at the bottom should be ascertained by dredging with a long-handled dipper, and the contents of the dipper should be examined critically. If a considerable quantity of sediment is brought up, it should be cause for rejecting the oil.

BAGASSE AS A SOURCE OF FUEL

The use of bagasse, or megasse, as it is sometimes called, as a source of fuel, dates from the earliest periods of cane-sugar manufacture, according to E. C. Freeland, in a paper read before the recent annual meeting of the American Society of Mechanical Engineers.

Bagasse, chemically, consists mainly of a tough fiber, sugar or sucrose, glucose and other reducing sugars (by a reducing sugar is meant one that will reduce Fehling's solution), and water. The fiber content ranges from 30 to 50 per cent; the sucrose from an almost negligible quantity to as high as 10 per cent; and the water from 40 to 65 per cent; the other constituents occur in such small amounts that they may be disregarded.

It has been found that the average Louisiana bagasse has a calorific value of about 8300 B.t.u. per pound of dry bagasse and from 3620 B.t.u. gross (with bagasse containing 56.7 per cent moisture) to 4800 B.t.u. gross (containing 42.8 per cent moisture). The net heating values are respectively 2200 and 3350 B.t.u.

One pound of bagasse will evaporate from 2 to 3½ lbs. of water "from and at 212 fahr." Assuming coal and fuel oil to have, respectively, calorific values of 14,000 and 19,000 B.t.u. per lb., then from 4 to 6 lb. of bagasse are equivalent to 1 lb. of coal and from 43 to 65 lb. equivalent to 1 gal (about 7.6 lb.) of oil.

In former years not much attention was paid to the drying of bagasse before burning it. It was the custom either to sun-dry it or to feed it to the furnaces in a wet condition, just as it came from the mills.

As to the economy of bagasse drying, many authorities claim that a great saving can be effected by drying this fuel before it is fed to the furnaces. This has been proved as a result of many experiments.

Professor Kerr says that in Louisiana 10 per cent of the total heat generated by the combustion of 1 lb. of bagasse is required to evaporate the moisture present. About 14½ per cent of the moisture in Louisiana bagasse was removed by drying it, and the dried bagasse had a heating value 55 per cent greater than the wet bagasse. This means that a saving of over 2½ gal. of oil will be effected per ton of cane ground. In a factory grinding 60,000 tons of cane per season this means a saving of about 164,000 gal. oil, or 3670 bbl., which, at $1.25 per bbl., means a saving of $4,587.50 per season.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

IMAGINATION IN ADVERTISING

BY H. A. LEMMON

(The advertisement which appeals to the good judgment of a purchaser will bring better results than the ad which bases its attractiveness upon low price only. The foundation builder for a business is the bargain measured by satisfaction and service. The author, who is sales manager with the Truckee River General Electric Company, of Reno, Nevada, has had many years of experience in the writing of advertisements.—The Editor.)

ONCE upon a time the merchants of a small city in northern California got into an egg war. One belligerent would no sooner grab his marking pot and produce a sign, "Eggs 40c," than his next-door rival would go him one better with: "Eggs 35c." One store kept out of the struggle. It displayed a nicely painted sign: "FRESH Eggs 45c," and backed it up with a dozen eggs washed and polished until their mothers would not have known them. The emphasis placed on the word "FRESH," by implication at least, discredited the eggs of competitors. Quite likely this incident furnished the foundation for the favorite yarn of the merchant who placed two signs in his windows: "Eggs 30c; Fresh Eggs 35c," when as a matter of fact all his eggs were fresh and from the same case.

It is quite possible that that sign of the non-combatant Placerville merchant is one of the best advertisements ever written, while that of his competitors probably belongs to that type that is poorest.

One of the most precious gifts we have inherited from that Providence which also made the octopus and the butterfly, is imagination, but like most priceless gifts it is rare, and yet we who are endeavoring to sell electric appliances and devices must depend upon it almost exclusively to get us the wherewithal to buy Uncle Sam's new green trading stamps.

"Eggs 30c" is a statement that doesn't excite the beholder or his imagination to any appreciable degree. Many of us have encountered it without losing our presence of mind or suffering severe nervous shock. Its only appeal is based upon the assumption that the passer-by cannot be happy until he becomes owner of a number of eggs and that he knows the market is something above that figure.

A lot of us once thought price the great appeal. It was perfectly logical to our minds that we were in business to sell goods; that all we had to do was to price them low enough and someone was sure to buy. Having that sort of a mind, of course, we sold cheaper and made more sales than our competitor (or did we?) and kicked "overhead" out of the way as being an ornamental theory invented by some literary salesman who we believed never made an actual sale in his life. Most of us who did so believe, are now in other lines of business, or will be just as soon as our creditors make an investigation. Others scorned to consider price in making a sale. These are the "impractical" fellows who splash mud on us as they whirl around

The customer doesn't want poor eggs at a low price—she wants good eggs and will pay what she must to get them

the street corners, and whose prosperity we ascribe to "luck."

The fresh-egg advertisement is a paragon because it seems impossible to tell a complete story in fewer words. It haughtily refuses to appeal to the baser form of bargain instinct by holding out the bait of low price, or even by including the word "large," as descriptive of the eggs. It only uses the price because that price is very high, compared to others, and therefore it implies quality. The word "fresh," however, does stimulate the imagination in every manner possible to stimulate it—that is, if you are interested in eggs for eating purposes only.

Not that we should belittle the pull of "bargain instinct" in our advertising of electrical goods. On the contrary, 90 per cent of our sales will be made because we excite it; but we can use it in a more interest-compelling form.

Perhaps we can illustrate: A suit of clothes for $20 is not, in itself, a bargain. A suit of clothes that

will last a year and continue to hold its shape and brightness is decidedly a bargain, even if it cost $30. It is not offering a bargain to the ladies who read our ads to tender percolators for $6, any more than it is to offer a suit of clothes for $20. So we see that a genuine bargain—the kind we can safely adopt as a foundation builder for our business—is measured by

A cheap suit may be a good bargain—but on the other hand, it may be a very poor one. Your customer knows that as well as you do.

the degree of service we may obtain from ownership of the article or device, and not from the device itself. The first suit of clothes was merely a suit of clothes. The other represented a year of service and satisfaction—therefore a bargain.

The two suits may have appeared much the same in the store. We were fortunate in buying the higher priced one—not because it looked ten dollars better—but because the salesman excited our imagination by suggesting in more or less subtle manner the pleasure and satisfaction and service ownership would give us. If our imagination were not set in motion in some manner we never would pay $30 for a suit when other suits might be had for $20.

Again: When we feel the pressing need of a suit of clothes and enter a store, we may be shown the two mentioned above. Perhaps the cheaper one is more appealing to the eye than the $30 one, and yet we select the latter. Why? The former appealed to the eye, but the more expensive one appealed to our imagination. If the salesman hadn't stimulated our imagination (or possibly the higher price itself did), we most certainly would have purchased the cheaper one.

LETTING THE CUSTOMER TALK is the moral of the story told by W. D. Kamm of the Great Western Power Company of Oakland, Calif., in a recent issue of "How-I-Did-It." Since the salesman's objective point is the securing of a signed contract from his prospect, there is only one way to judge his success as a salesman and that is by the number of bona fide contracts he secures.

Now, what stands in the way of the less successful salesman from equaling the exploits of his fellow craftsman? Obviously, he works along wrong lines. As the writer sees it, one of the most prevalent faults of the average salesman is his dogged determination not to let anybody out-talk him, and in his zeal to keep up his end of the conversation, he engages in a conversational marathon with his prospective customer that often ends in the exhaustion of both.

The object of the interview is lost in an argument on some irrelevant matter, but our garrulous salesman returns to the office and tells his superior that he had a long talk with "Mr. C.," although he neglects to state that both he and "Mr. C." carefully avoided any reference to the subject matter.

Let your prospect take the conversational bit in his teeth and run away if he pleases, but hold him in his course by timely references to the object of your visit. A little story of the writer's personal experience with one of these long-distance talkers might serve to illustrate the point:

Four of the five salesmen had tried to sign up "Mrs. J." and they had all failed. She had called up the office and complained of the impudence of two of them and the others had met her and come off with experience only. I heard the boys talking of their attempts to placate the "old lady." They all agreed that she was an "iron-jawed talking machine," and not any too particular what she said. They had all been routed and were through.

I thought to myself that I would take a chance with this ogress, so the next morning found me on her front porch, ringing the door bell. The door opened and there she stood.

"Good morning, 'Mrs. J.,'" I said in my most businesslike tones, at the same time handing her my card.

The old lady adjusted her spectacles, carefully read the card, and looked me over from head to foot. Then deliberately, like a strong man toying with a weight as he prepares to lift it, she rolled her tongue around, opened her mouth and started talking. "I suppose you have come out here to try to get me to sign up with your company," she snapped. "They would have had my business long ago if they did not have such impudent representatives in their employ. Why, do you know, 'Mr. Q.,'" and away she went.

I decided to simply hold her in her course and give her a free rein. Two hours afterward, and we had stood up at the door all this time, she suddenly stopped talking, looked at the tall clock in the hall and said, "My, I have almost forgotten Mr. J.'s lunch," and in the same breath, "Well, Mr. 'Q.,' you have talked me out of my business. I'll sign with you." I produced my contract blanks and pencil and as she signed she loked at me and said, "Can't you come out some night and meet my husband? I enjoyed your conversation so much."

And I can assure you that, aside from handing her my card, all I said to her was, "Good morning." I was too exhausted to say good-bye, and it is needless to say that I have not yet met her husband.

All of which happened four years ago and the old lady is still numbered among our satisfied customers.

Moral: He is best sold who sells himself.

Western Ideas

A WRECKED WINDOW is ordinarily placed to the debit side of the card ledger, but a clever electrical dealer turned it very quickly to the credit side of his business. An automobile, crashing into the store of Kohlwey-Smith-Alfs Electric Company of San

There was no "break' in the business of this enterprising store

Francisco, broke up one of the large plate-glass windows rather badly. Quick to see that the wreckage would gather curious crowds, the proprietor placed a sign, bright with red letters, "Our goods are so popular that they **drive in** to get them." In contrast to this bare, broken window, the one opposite was a bright and attractive display of the "so popular" wares.

Undoubtedly the expense of the breakage was more than refunded by the interested observation of pedestrians and the admiration excited by turning an unfortunate occurrence to good profit.

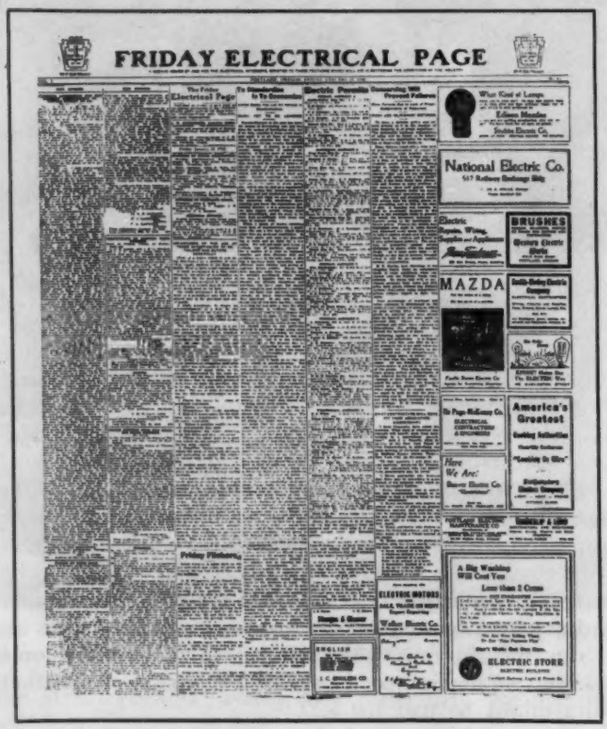
TAGGING THE MACHINES of the farmers who attend a state fair is an idea which has been worked out with considerable success. The automobiles and buggies which the farmers drive to the fair grounds are usually parked in a single enclosure. One exhibitor of electrical apparatus conceived the idea of tagging the machines with a notice of his exhibit and its location—and added for good measure some of the attractive literature with which he was furnished by the manufacturers.

This served a double purpose. It made certain that every visitor to the fair was introduced to the brands of electrical ware which he carried, and also brought many to the exhibit booth who otherwise might have passed it by unwittingly.

A similar idea was used by a dealer in a small town who "tagged" every machine which came into town. The tag is attractively gotten up with a picture of apparatus—the cut was furnished by the manufacturer—and with the name and address of the shop across the bottom. The owners of the machines not only knew that such an establishment was in existence, but they were impressed by the good taste and intelligence of this owner as expressed on this informal "calling card."

TO PREVENT YOUR WINDOWS FROSTING, use an electric fan. In regions where the thermometer often drops below zero, the electrical dealer is frequently bothered by the frosting over of his windows. Obviously, a window display completely obscured behind a curtain of white, is of little use either to the owner of the store or to the customer who is interested in the electrical ware displayed. Although many ideas for the prevention of this condensation have been suggested, such as the inner ventilation of the window space, one of the simplest and most effective—and certainly the most appropriate for the dealer in electrical ware—is to place an electric fan to one side of the window. By directing the breeze against the glass the frost easily clears up.

THE FRIDAY ELECTRICAL PAGE has come to be a weekly institution in Portland, Oregon. A full page of The Daily Record-Abstract, a business newspaper of Portland, is cared for every Friday by the



Interesting to the layman as well as the contractor-dealer

Oregon Association of Electrical Contractors and Dealers. The slogan at the head of the page explains that it is devoted to "those features which will aid in bettering the conditions of the industry." Articles of interest to contractors and dealers are reproduced from the various electrical journals, and items of local interest form a "Friday Flickers" personal column. The page offers a splendid medium for advertising, and fully two columns are always devoted to contractor-dealer ads. Electrical permits granted and like information are given for the convenience of electrical readers. The page has come to be looked for and read by many who are not connected with the association, and besides serving as a society publication is an excellent advertisement to the general public of the fact that the electrical contractors and dealers are a wide-awake and progressive group.

BIG, LITTLE AND COLORED STICKERS, stamped with their trade-mark, have proved a successful business getter for Eardley Bros., electrical contractors and dealers of Salt Lake City. The most used are the little black and white ones. A ring of clearly printed and catchy phrasing surrounds the trade mark. The bright yellow and black seal attracts

A trade mark that sticks in the mind as well as on the merchandise

the eye at once. It differs from the smaller size by an outer ring in black and yellow checks, and a few words which give the business address and an idea of goods other than electrical which may be bought there.

These two stickers find their way to many unexpected places which can not be reached by other forms of advertising. Mail forms, photographs, books, etc., bear these seals, which serve not only as identification marks, but as business reminders. The larger seal, which is used in printed advertisements, is a combination of the two gummers plus an outer ring in bold type, "Make our store your shopping center," and undoubtedly this pleasant invitation finds many acceptances.

Stickers like these—bearing a trade slogan—lend themselves to a great variety of usage. For instance, the seals can be stuck at random on all materials—packages, wrapping paper, catalogues, etc. There is also an opportunity for change of color at different seasons of the year: Green and white is popular in commemoration of St. Patrick; red, white and blue come to the fore in July with the Fourth, and at Christmas time the vivid reds and greens would suggest that bright and useful gifts could be purchased at that particular electric store.

A BUREAU OF INFORMATION, fostered by electrical societies for the use of architects, was the suggestion made by H. C. Reid, president of the California Contractor-Dealers' Association, at a recent meeting of the San Francisco Electrical Development League.

The relation that the electrical man has had with the architects in the modernizing and beautifying of San Francisco's rebuilding period and San Francisco's exposition, points clearly to one conclusion, the necessity of still closer co-operative relationship

In these days of rapid development of all things mechanical and electrical, a bureau of information at the disposal of the architects, one that they could at all times turn to for information they desire, a bureau that would satisfy them with dependable, scientific and impartial advice on electrical matters, would be a natural function that a league of electrical men should perform.

The public approves or disapproves of things electrical according to the satisfaction it gets from the use of the articles utilizing electrical energy. Those factors which have contributed and which are primarily responsible for successful service are to a large measure unknown and unthought of. The foresight and the plans of the architect, the skill of the contractor handling the work, the unfailing service of the power company—each contributes its part to this satisfaction

The Electrical Development League, Electrical Contractors and Dealers Asociation, and other similar organizations are each doing its part in our commercial development.

CARRYING A RED HOT STOVE used to be a joke in old-fashioned vaudeville shows, but it has added comfort to the chill of New York's fuel-less winter. The accompanying illustration shows a group of theatrical people in New York making use of small electric stoves while traveling on the surface cars. Of course, the idea is more or less a "publicity stunt," but it suggests possibilities to the wide-awake contractor-dealer. Little hand and foot warmers which contain a heated brick or a few coals, have long been known to sleigh riders—even as far back as grandmother's day—and there is no reason why the idea should not develop to its electrical conclusion, as have the tallow dip and the wood stove.

Better than a muff on heatless days

A simple, easily charged heater, such as the ones shown here, would find a variety of useful applications. There are any number of uses to which it might be put in the home, the fact that it is easily transported from place to place making it possible for it to fill a need similar to that of the electric flashlight for emergency lighting. Imagine what comfort such a heater might give to the traveler abroad, who too often must put up with chilly rooms and traveling compartments—or to the elderly lady who must visit in a home unprovided with adequate heating facilities.

THE MANUFACTURE OF ELECTRICAL APPLIANCES

BY M. H. MERTZ

(Every man handling electrical ware should know as much as possible about his product. If you can tell a customer how the appliance is made and the reason for its good points, he will come much nearer believing what you say in your recommendation. This interesting article tells of the assembling of electric irons and other household devices, at Ontario, California.—The Editor.)

The recent merger of three large manufacturers, viz.: the appliance department of the General Electric Company, the Hughes Electric Heating Company, and the Hotpoint Electric Heating Company, into a new corporation to be known as the Edison Electric Appliance Company, Inc., centers interest on one of the largest and certainly one of the most interesting phases of the electrical industry, viz.: the manufacture of household electrical appliances.

The promotion and sales work in the new corporation will be carried on by each of the three divisions as they were before consolidation. The general offices after January 1st will be moved from Ontario, California, and Pittsfield, Mass., to Chicago, and installed in the building now used by the Hughes Electric Heating Company, 5560 Taylor street.

Manufacture will be consolidated—recent addition of 30,000 feet of floor space in the Hughes factory enabling special machinery to be installed which is now in use in the General Electric factory at Pitsfield, Mass.

The Hotpoint division will operate its factories at Ontario, California, and at Chicago, as before. The Ontario factory covers several acres, and consists of several large one-story concrete buildings, all of which are fireproof and thoroughly ventilated.

Good light, good ventilation and good treatment in general are absolutely necessary in a plant of this kind, as the work must be standardized on such a high plane that a perfect article can be placed on the market at a very low cost. Low cost is necessary that the buying public may become acquainted with and use these economical and efficient articles in their homes, which, although often seeming to be luxuries at first, soon justify themselves to the progressive housewife.

Quite a feature of the Ontario plant is the Hotpoint Club, with its electric cafeteria and grocery store, where the employees can obtain their meals and groceries at a very low cost. The aim of those in charge of the store and cafeteria is to give first-class service at a minimum cost, and it is chiefly through the generous patronage of these institutions that the various social and athletic activities of the club can be maintained.

ASSEMBLING A GRILL

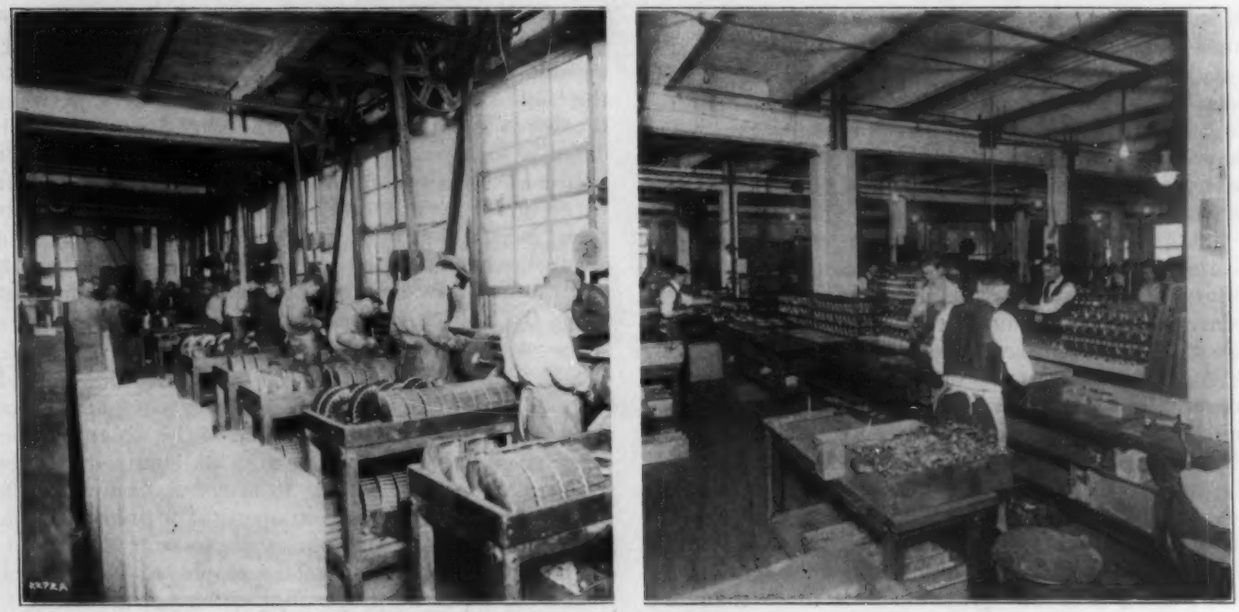
The work is done in a systematic manner, similar to assembling an iron, each man having his particular part.

AN EXPORT SHIPMENT

Goods must be carefully packed and protected against dampness and sea water.

These and other innovations are examples of what the company is doing for the benefit of its employees. It isn't philanthropy—merely common sense; an investment that pays large dividends, as every progressive factory manager knows.

There are about thirty-five parts to an electric flatiron, and the preparation of the various parts and their assembly is particularly interesting. After the parts have been plated, polished and tested, they are placed in receptacles on a long table and the irons assembled in batches of ten. Each workman has his designated task to do in the assembling, and the speed with which ten irons are completed is amazing. Considering that nearly 300 individuals handle the parts of the product and assist in the assembling, the de-



ASSEMBLING AN IRON

Parts of the iron are strung along the benches and assembled in lots of ten. Each workman has his particular part of the operation to do. The picture at the left shows the buffing of the sole and pressure plate of the irons. The plates are thoroughly cleaned in this manner before the chemical bath is applied and the plating is done.

gree of efficiency and economy of motion attained is remarkable.

The cleaning and plating of the various parts of an article are done in a separate department, said to be one of the best shops of its kind in the state. Each piece of iron, after buffing, is subjected to a vigorous washing process similar to that used in a laundry, but in this case powerful chemicals are used to make the parts absolutely clean.

The sole plate, or base, of the iron is an ordinary piece of iron drilled and tapped so as to fit into the other parts. Over this sole plate is placed the heating element, with the leading-in wires protruding at the back. Over this is placed a pressure plate, similar to the sole plate. These three, the sole plate, element, and pressure plate, over which the polished shell is placd, are fastened together by screws forming the body of the iron proper. The contact guard (into which the plug of the attachment cord fits) is fitted into the shell, and into this in turn is placed the handle uprights, and the whole is fastened by two screws. The wooden handle is placed between the uprights and held by little sharp points of metal protruding from the uprights. One screw is inserted in each end of the handle, fastening it firmly into place. The iron is now complete—everything is made to fit, and fit it does.

Each iron, after completion, is given a "breakdown test" of 600 to 900 volts to locate and electrical weakness or faults. As 220 volts is the maximum service voltage used to operate an iron, this breakdown test is very adequate.

The construction of the heating element is a particularly fine piece of work. Two strips of white mica are wound separately with nickel chrome wire, but the winding is continuous, the same piece of wire being used for both strips. The winding, done by machinery, is a very delicate operation. Two pieces of mica the shape of the ironing surface, are placed above and below the wound core and the whole fastened firmly together.

A very prominent feature of the iron manufactured by the Hotpoint Electric Heating Company is its "hot point." By winding the resistance wire closer at the tip, more heat is generated per square inch of ironing surface at the point, with a graduated reduction toward the back of the iron.

Attachment cords for the irons and other utensils are cut to length, the ends trimmed and cleaned, and the socket and plug attached. The cutting, trimming and cleaning is done by machinery, the rest by hand. This preparation of cords is done by a force of women in a separate department.

The process of cleaning, plating, polishing, assembling and testing of every article made by this company is practically the same as for the iron.

LLOYDS' REGISTER OF SHIPPING—USE OF ELECTRIC LIGHT ON VESSELS

(The impetus given to shipbuilding by the demands of war has had its correlative effect in the electrical industry. A knowledge of the rulings under which ship wiring must be done is imperative to the electrical contractor. The majority of ships built for the Allies, as well as many American vessels, follow Lloyds' rulings, a portion of which code was given in an earlier issue. This article completes the series.—The Editor.)

Distribution

1. The main switchboard should, if possible, be fitted in the dynamo room, to which all main circuits throughout the ship should be brought, a switch and fuse being fitted thereon for each circuit. The distribution boards for further sub-division of the current should be placed in conveniently accessible positions, and each such switchboard should be similarly fitted with a separate switch and fuse for each sub-circuit. Fuses should be fitted to each lamp circuit where these are made with reduced size of wire. If vessels are

wired on the double-wire system, fuses should be fitted to each cable of each circuit.

2. In cases where electric lights are used for the mast-head light and side lights, the switches controlling these lights should be placed in a position where they can be controlled by the officer of the watch, or other responsible person, and cannot be tampered with by other members of the crew, or by passengers, etc.

3. The switchboards should be of slate or other incombustible non-conducting and moisture-proof material. The switches should be on the quick-break principle, and should be so constructed that they must be either full "on" or completely "off"; that is, they must not be able to remain in an intermediate position. They should have ample rubbing surfaces, and their conductivity should not be less than that of the wires connected to them, and they must be incapable of forming a permanent arc when breaking circuit.

4. Fuses should be fitted to each main or auxiliary circuit, on the switchboards, as near as possible to the switches of these circuits. If the switchboard is not fitted near the dynamo, or if more than one dynamo may be used on any one circuit, then fuses should also be fitted to the main cable as near as possible to each of the dynamo terminals.

5. All fuses should be fitted in easily accessible places, and as near as possible to the commencement of the cables or wires they protect. They should be mounted on slate or other incombustible bases and be arranged so that the fused metal may not be a source of danger, and where they are fitted with covers these should be incombustible.

6. All fuses should be of easily fusible and non-oxidizable metal, and should be so proportioned as to melt with a current 100 per cent in excess of that which the cables they protect are capable of carrying as shown in Table 1. The terminals must be so spaced apart or screened that an arc cannot be maintained when the fuse is blown. Separate single fuses and not "double-pole" fuses must be used on circuits where the pressure exceeds 125 volts.

7. The fuses for each cable should be made of standard dimensions, so that a large fuse cannot be used for a small cable by mistake; or, if wire fuses are used, permanent instructions should be fitted on or near each switchboard giving particulars of the proper size of fuse for each circuit.

8. In shaft passages and in damp places, all lamp switches and fuses should be of strong water-tight patterns, or should be placed in water-tight boxes having hinged or portable water-tight covers. No switches or fuses are to be placed in bunkers.

9. There should be no joints in the cables leading from the dynamo to the main switchboard, nor in those leading from the main to auxiliary switchboards, nor should branches to single lamps be taken off these cables.

10. A voltmeter should be supplied with each installation. If more than one dynamo is fitted, neither being capable of the whole of the output, an ampere meter should be supplied with each dynamo, unless each dynamo is protected by extra sensitive fuses.

Joints With Hull

1. In vessels fitted on the single-wire system, all the joints with the hull should be placed in accessible positions. Those for single lamps or for small cables should be made with brass screws not less than three-eighths of an inch in diameter, carefully tapped into the iron or steel, having white brass washers, between the wires and the vessel, or the wires should be soldered to brass-faced washers. For larger cables above 7/18 S. W. G., and for the pole of dynamo the cable wires should be properly sweated into brass or copper shoes, which should be bolted to the vessel. The iron or steel, where contact is made, should be filed bright, and the area of contact should not be less than eight times the section of the copper of the cable.

In Vessels Carrying Petroleum

1. The single-wire system must not be adopted for any part of the installation. Switches and fuses must not be fitted in places liable to the accumulation of petroleum vapor or gas, and all lamps in places where it is possible for gas to accumulate must, with their holders, be enclosed in air-tight fittings of thick glass. All wires in such places are to be lead-covered, or the insulation of the cables employed is to be of such a nature as not to be affected by petroleum. No joints of cables, switches, or fuses should be fitted in the pump-room, but the wires for each lamp therein should be carried to the lamp from a distributing junction box placed outside the pump room or companion.

(The following paragraphs referring to the effect of the electric light installations upon the compasses are issued as suggestions, not as rules.)

Position of Dynamos and of Electric Motors

1. The position and type of dynamos and electric motors should be such that the compasses will not be affected.

Cables

2. In vessels fitted with continuous current dynamos, and wired on the single-wire system, no single cable should be carried within 30 feet of any compass, and cables conveying heavy currents should be fixed at still greater distance. If it is necessary to fix any cables within this distance, then for all parts of the vessel lighted from this cable the concentric or double-wire system should be adopted, the return wire being carried as near the flow as possible in the vicinity of the compasses.

Adjustment of Compasses

3. The compasses should be adjusted with the dynamo not working, after which the vessel's head should be put upon the different courses, with the dynamo running with open circuit and with all possible combinations of the current switched "on" and "off" all circuits passing near the compasses. These indications should be compared with those obtained with the dynamo stopped, and any serious deflections of the compasses remedied before the vessel sails.

SHOW CASE ILLUMINATION

A display stand which, when placed on top of a glass showcase, will throw a light downward to illuminate the wares in the case, is a new development of camouflage. The effect of the illumination, whose source is not apparent, is very mysterious. The effect is produced by a light concealed in the hollow base, but the stand looks so useful otherwise that it is not suspected.

Technical Hints

BY GEORGE A. SCHNEIDER

(Formerly the reverse phase relays were required only by certain central stations in various parts of the country, but more recently the question of such protection has been taken up by the Bureau of Standards and recommendations for relays of this type have been included in the National Safety Code. The Board of Fire Underwriters has now taken the matter up, and a ruling making the installation of reverse phase relays mandatory for certain classes of service is being included in the 1918 issue of the National Electrical Code. This article on the type of relays and the service which may be expected of them, is therefore of particular and timely interest. —The Editor.)

REVERSE PHASE RELAYS

Reverse phase relays are used in connection with control equipments for polyphase motors operating elevators, hoists, conveyors, cranes, machine tools, textiles and similar machinery. Their function is to guard against injury to operator, damage to machinery or manufactured product which might occur during a reversal of motor rotation in case of an accidental interchange of motor leads or wiring between the motors and source of power. A reversal of any two wires of a three-phase motor circuit or the wires of either phase of a two-phase motor circuit will cause reversed direction of rotation. This is the principle employed in polyphase motor controllers or systems of control. However, an accidental reversal of rotation may produce destructive results. This is particularly true in connection with elevator equipments. Movement of the car in a direction opposite to normal due to an accidental interchange in the leads would be very likely to confuse the operator. If there are no protective devices to guard against it, this may result in more or less damage to the elevator mechanism due to the car running wild and striking the overhead beams at the upper limit of travel or becoming jammed in the pit at the bottom of the shaft, or may result in personal injury or loss in life.

A reversal of the phase or the wires of a polyphase circuit, while not necessarily of frequent occurence, is apt to occur at any time and is a factor which should always be considered and guarded against by the provision of suitable protective devices. Reversals may accidentally occur, especially on aerial systems, during repairs due to storms, fires or other causes, or when making extensions to lines or changes or repairs to the individual service. Likewise reversals may also occur in the interior wiring or other apparatus due to re-wiring or making repairs or changing defective apparatus such as controllers, circuit breakers, switches, motors, etc.

The most commonly used equipments for protection against phase reversal consists of a reverse phase relay in conjunction with a suitable shunt trip or under-voltage circuit breaker. However, there is one line of reverse phase protective devices on the market in which a spring operated switch is employed. Under normal conditions this switch is held open by the phase reversal device, but in case of reversal the switch is tripped and short circuits the leads to the motor. The circuit must then be interrupted by some other equipment such as a circuit breaker or fuses having suitable overload characteristics.

Reverse phase relays may be either of the series or potential type and may be fitted with either circuit opening or circuit closing contacts. Circuit opening contacts are used to open the control circuit of contactors or of an under-voltage release attachment on oil circuit breakers or other devices. Circuit closing contacts are used with devices that are equipped with shunt trip coils. These relays may be of the automatic or hand reset type. That is, in the automatic type the contacts are restored to normal position when the circuits are again re-established in proper phase relation, while in the hand reset type the relay contacts must be manually reset after each operation.

Some of these relays will protect the motor against phase failure as well as phase reversal. For this reason some are known as phase failure and phase reversal protective devices. It is therefore necessary to differentiate between a phase reversal and phase failure device, although many of the so-called reverse phase devices on the market will also give protection against phase failure as just noted.

At this point it should be noted carefully that while certain types of phase reversal protective devices will also protect against phase failure, a device which will protect against phase failure will not always protect against phase reversal. For example, any type of circuit breaker or even a fuse equipment that will give proper overload protection to a polyphase motor will also prevent single-phase operation because of the considerable increase in current even with the motor operating without load or under light load. This question was discussed quite fully in the October 15th issue of the Journal of Electricity in this department. It is recommended that our readers study that article in connection with this one.

The standard definitions applying to the kind of protection secured by these devices as adopted by the Electric Power Club, are:

Phase failure protection. The effect of a device operative on the failure of power in one wire of a polyphase circuit to cause and maintain the interruption of power on the remaining circuit.

Phase reversal protection. The effect of a device operative on the reversal of phase relations in a polyphase circuit to cause and maintain the interruption of power in all of the circuits.

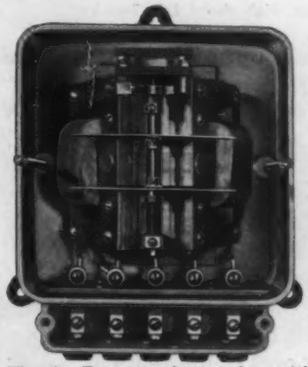


Fig. 1.—Reverse phase relay with casings removed

One well-known type of reverse phase relay is illustrated in Fig. 1. This relay is a potentially operated device. The electrical elements consist of two laminated iron electro-magnets, the coils of which are connected directly across opposite phases of the supply current. A vertical shaft supported by bearing pivots carries two aluminum sectors which are partially enclosed by air gaps in the magnet circuit. The magnets are so placed that when energized from a polyphase circuit a rotating field is produced. This field acting upon the sectors causes the latter to rotate in a direction dependent upon the phase rotation of the supply circuit. A con-

tact attached to the shaft and receiving current through a flexible connection, makes or breaks the trip coil circuit of the accompanying circuit breaker, according to the style of contact used, when the direction of phase rotation is such as to cause the relay to operate. The device is mounted in a substantial dust-proof iron case, with sealable wing nuts, and terminal chamber having binding posts for the connection leads. The device may be used on either two or threephase circuits.

This style of relay is supplied with either circuit opening or circuit closing contacts. In the event of phase reversal the relay with circuit closing contacts closes the auxiliary circuit which energizes the trip coil of the circuit breaker, which must be of the shunt trip type, thus opening the main circuit. When used in conjunction with an under-voltage release circuit breaker, the relay is equipped with circuit opening contacts. In this case the action of the relay is simply reversed, the auxiliary circuit being opened in event of a phase reversal and thereby tripping the main circuit breaker. This device will also operate in case of phase failure due to a blown fuse, broken wire or similar cause.

Another type of relay which is described by the manufacturer as a phase failure and phase reversal protective device is shown in Fig. 2. In construction it is much similar to a miniature polyphase squirrel cage motor, but is arranged to be mounted with the shaft in a vertical position. Like the other type of relay already described, this device is equipped with contacts which are connected in series with the auxiliary tripping or operating circuit of the main circuit

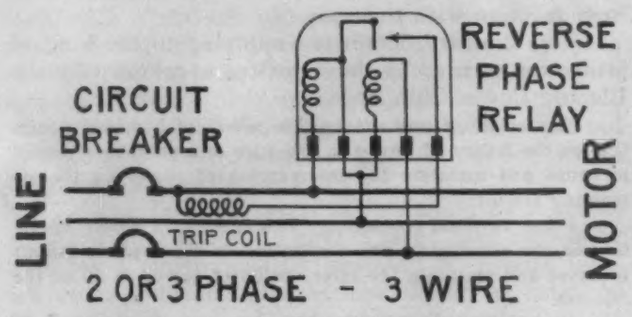


Fig. 3.—Circuit closing relay with shunt trip breaker

interrupting device. Circuit opening contacts are standard, but circuit closing contacts can also be supplied when required. This device is generally used in conjunction with a magnet switch or contactor which automatically opens and closes as the contacts in the device open or close the control circuit of the switch.

The manufacturer of this device states that it is designed to perform the following functions:

(a) If the supply voltage falls below 70 per cent of normal, the relay opens the control circuit of the motor controller, and keeps it open until the line voltage returns to at least 85 per cent of normal.

(b) In case of phase failure, caused by the opening of one of the supply lines at any point, the relay opens the control circuit, if the motor is under appreciable load, and keeps it open until the fault is corrected. If the load on the motor is very light, so that no harm would result from its running single phase on account of the phase failure, the device may not operate until the load is increased or the motor shut down.

(c) In case of phase reversal the relay opens the control circuit and keeps it open until the phases are re-connected in the proper order.

Fig. 2—Phase failure and phase reversal protective device (cover removed)

In order to obtain the maximum protection, reverse phase relays should be connected to the circuit as close to the terminals of the motor as possible. Under this condition the motor will be protected against reversals which may occur in the interior wiring, or at the switches or other apparatus, installed in connection with the motor. Where motors are reversed by a switch or controller in order to reverse the direction of an elevator or other machine, the relay must be connected between the source of supply and reversing switch or controller of the electrical equipment.

Where motors are connected to the elevator mechanism by a straight and cross belt, the relay should be connected between the controlling switch and motor. For motors operating screw pumps, on hydraulic systems, the relay should be connected between the controlling switch and the motor. Where two or more elevators or other machines requiring protection against phase reversal are connected to the same service, it is advisable to provide a separate relay and circuit breaker for each, in order that the relays may be connected close to the motor terminals.

The connections for the type of relay illustrated by Fig. 1 are shown in Fig. 3. In this diagram the equipment consists of a circuit closing relay in conjunction with a double-pole circuit breaker of the shunt trip type. It will be noted that the magnet coils of the relay are connected directly across two of the phases and the contact within the relay is placed in series with the breaker trip coil so that when the contact is closed the trip coil receives the full voltage measured across one phase. It will further be noted that fuse protection for the control circuit is not provided. There is very little likelihood of trouble in such circuits and it is better to connect in solid, as it adds to the reliability of the equipment. However, the control circuits should always be protected from mechanical injury.

As pointed out in another paragraph, some relays are fitted with hand reset contacts. This feature is a safeguard and also serves as an indication of the cause of the automatic opening of the motor circuit. With the hand reset feature it is necessary for the operator to go to the relay and reset the contacts before the motor can be thrown on the line again.

WASTE IN POSTAGE

Up-to-date business concerns eliminate the wasted postage item by enclosing a blotter advertising novelty of some sort. Thus by utilizing the waste which would otherwise be velvet to the postoffice department, the business man insures that each of his letters, whether it concerns sales, orders, complaints, or financial matters, is doing its duty in promoting and explaining some feature of the concern's business.

PRIZE WINNERS IN SUBSCRIPTION CONTEST

The Journal of Electricity herewith announces with deep gratitude and appreciation the results of the subscription contest which has been under way during the past ninety days, and which closed promptly at midnight January 31, 1918. The subscriptions that have come in from all quarters, bearing the names of central station managers, commercial men, jobbers, industrial engineers, manufacturers, manufacturers' agents, utility bonding houses, electrical engineers, teachers of electrical engineering, and electrical contractor-dealers, are indeed most gratifying. By letter and wire the entire country west of the Rockies attested the interest and enthusiasm of the readers of the Journal in its success.

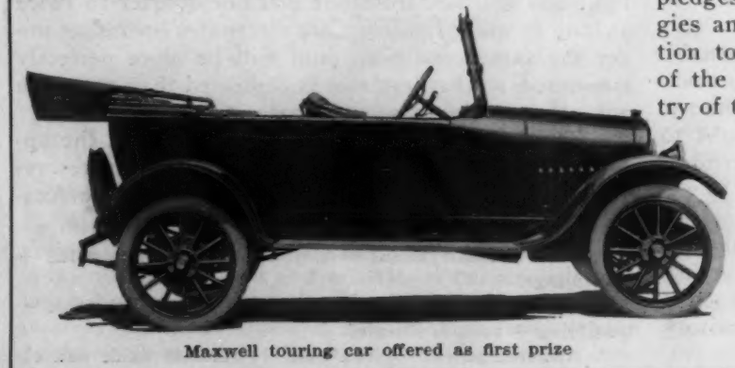
J. W. Redpath taking possession of his new automobile

J. W. Redpath, secretary of the California Association of Electrical Contractors and Dealers, was literally swept into first place by the avalanche of subscriptions that came in on the final day of the contest from electrical contractor-dealers and central station men.

C. B. Merrick, the winner of the second prize, proved a consistent and effective worker among professional men in the industry. As a graduate of the electrical engineering department of the University of California, and as a former central station man, his subscriptions among engineers and power men proved of high order.

Although the Utah Society of Electrical Contractors and Dealers were in the lead for a long period of the contest, and finally won but third place, still the enthusiasm was such that practically every contractor-dealer and central station man of prominence in that commonwealth is now upon the subscription list of the Journal of Electrcity.

The detail report of the judges of the contest is as follows:



Maxwell touring car offered as first prize

San Francisco, Cal., February 8, 1918.

Journal of Electricity,
San Francisco, Calif.

Gentlemen:

After careful investigation of the records submitted in the Journal of Electricity subscription contest, your committee of judges find that the following are the winners of the several prizes offered on the basis of number of points credited to them:

First Prize: J. W. Redpath, Secretary California Association of Electrical Contractors and Dealers, 3380 points.

Second Prize: C. B. Merrick, research engineer, Rieber Laboratories, San Francisco, 1925 points.

Third Prize: Utah Society of Electrical Contractors and Dealers, 1790 points.

Fourth Prize: W. R. Herstein, electrical supply company, Memphis, Tenn., 580 points.

Fifth Prize: J. W. Oberender, Secretary Oregon Society of Electrical Contractors and Dealers, 520 points.

Sixth Prize: H. F. Schultz, Electric Appliance Company, San Francisco, 245 points.

Seventh Prize: M. S. Orrick, assistant sales manager, Western Electric Company, San Francisco, 120 points.

Very truly yours,

H. F. JACKSON,
ALBERT H. ELLIOT,
H. C. REID.

In making this announcement of the splendid outcome of the subscription contest, the Journal of Electricity desires to express again its heartfelt appreciation of the support manifested by the readers and well-wishers of the Journal of Electricity, and in response to this evident goodwill for the Journal, apparent on all sides, the Journal pledges again its energies and its consecration to the upbuilding of the electrical industry of the West.

Grafonola offered as second prize in Journal of Electricity subscription contest, won by C. B. Merick

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(If you are granted a license to manufacture a patented article, you may not have the right to sell it. The differences between an assignment, a grant and a license in relation to patent rights are so intricate and complex as to require the nicest legal discrimination in their application. A court decision which points plainly the type of invention which is recognized as patentable—and a description of recent ideas by Western inventors are further included. The authors are members of a well-known firm of patent attorneys in San Francisco.—The Editor.)

TRANSFER OF PATENT RIGHTS

Assignment

The monopoly, granted by a patent, comprises three exclusive rights, to-wit: First, the right to prevent all others from making the patented article; second, the right to prevent all others from using the patented article; and third, the right to prevent all others from selling the patented article.

The entire title to a patent or an undivided part thereof, throughout the United States, may be transferred by an instrument in writing called an assignment.

The transfer, for a specified territory less than the United States, of the three rights comprising the patent monopoly, is called a grant.

Such an assignment or grant must be in writing, but no particular form thereof is prescribed by the patent laws. An assignment or grant should be recorded in the United States Patent Office within three months after the execution thereof, because, unless so recorded within said period, it is void as against a subsequent purchaser for value without notice of such prior instrument.

The execution of an assignment or grant should be acknowledged before a notary public because the notary's certificate of such acknowledgment is prima facie evidence of the execution or signing of the instrument by the patent owner.

Rights of action for the past infringement of a patent are not conveyed by an assignment or grant unless they are specifically referred to therein and transferred thereby. It is, therefore, advisable to insert in the assignment a clause conveying all rights of action for past infringement of the patent.

During the pendency of an application for a patent, an assignment may be made of the patent that may be finally granted on such application. Such an assignment should contain a request that the patent be issued to the assignee.

License

A license is a privilege or permission given by the patent owner to the licensee to exercise a portion of the rights conferred by the patent. For instance, the grant of the exclusive or non-exclusive right to make a patented article, within a specified territory, would be only a license, as the exclusive rights to use and sell such article within such territory are not transferred by such a license. The transfer of the exclusive right to make, to use and to sell such article in such territory would be a grant because such a transfer would include all the rights for such territory conveyed by the patent.

If a licensee is given the exclusive right to make and sell a patented article in the State of California, he could not prevent anyone from buying such article in Nevada from a licensee for such state and then using it in California, because, under the terms of his license, he does not have the exclusive right of using the article in California.

Due to the complex nature of the patent monopoly and to the various principles of law controlling the interpretation of patent assignments, grants and licenses, many complications and unforeseen difficulties may arise if such instruments are attempted to be drawn by those not thoroughly familiar with the patent law.

Licenses may be oral or written and expressed or implied. The law makes no provision for the recording of licenses.

Unless a license specifically provides it may be transferred by the licensee, it is personal to the licensee and connot be conveyed by him to another.

A license runs for the life of the patent unless some specified term is mentioned therein.

Decision Involving Question of Invention

In a recent case, heard by the Court of Appeals of the District of Columbia, the question decided was whether or not it required invention, on the part of the applicant for a patent, to take the step he did in view of the prior art disclosures of two German patents and one Austrian patent.

The combination of elements, comprising the applicant's invention or contribution to the art, was described in his claim as follows:

"A slow-consuming luminous arc light electrode comprising a metallic shell and a filler composed principally of rutile [titanium oxide] and sodium silicate, substantially as and for the purpose described."

Regarding his said structure, the applicant said:

"I have found that an electrode constructed as described will give a practically steady, strong, white light and will last from one and one-quarter to twice as long as other luminous arc electrodes operating under the same conditions, and will be more perfectly consumed, so that less soot is deposited than that with any other luminous arc electrode."

The following is a tabular comparison of the applicant's structure with the three prior structures respectively disclosed in the two German and the Austrian patents:

First German patent = iron tube + titanium oxide + iron filings.

Second German patent = iron tube + titanium oxide + iron filing + sodium silicate.

Austrian patent = iron tube + titanium oxide and expressly omitting iron filings and sodium silicate.

Applicant's structure = iron tube + titanium oxide + sodium silicate and expressly omitting iron filings.

The foregoing shows that applicant refused to be guided by any one of said foreign patents. In his structure, the applicant omitted the iron filings present in both German structures, but omitted in the Austrian structure, and he used the sodium silicate found in the second German structure but omitted in the first German and in the Austrian structure.

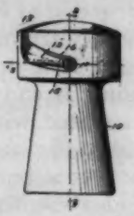
The court, in finding it amounted to invention to make the applicant's combination, said:

"It is no argument against patentability that applicant's invention consists of a combination of elements old in the art. * * * It is conceded that the art has not been developed to the point where accurate results may be obtained by reasoning from cause to effect. Development depends almost wholly upon experiments. The present case is not one where the advanced step taken by the applicant, even by the combination of elements old in the art, belongs in the realm of mere mechanical improvement obvious to one skilled in the art."

NEW IDEAS FROM THE WEST

Insulator

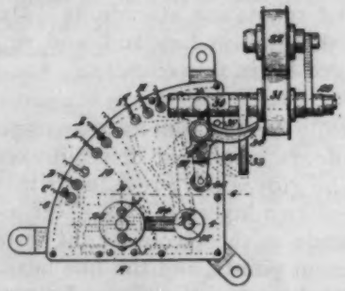
Patent No. 1,251,416, issued to Benjamin S. Purkey of Tacoma, Washington, shows a new form of insulator which is designed to firmly grip and hold the line wire without the use



of any auxiliary clips or clamps. The head of the insulator is provided with a diametrical spiral wire receiving slot in which the wire moves to a seat as the insulator is turned on the wire. When in its seat the wire lies in a straight, undeflected path diametrically across the insulator and is held in place against axial movement by ridges on the groove which bite into the wire.

Emergency Stop for Electrically Driven Apparatus

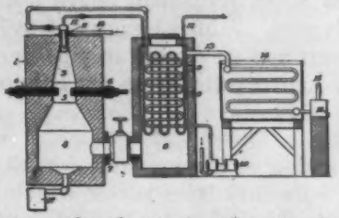
Patent No. 1,250,708, issued to Caswell D. Swett of Redwood City, California, discloses a novel and apparently meritorious emergency stop for electrically driven apparatus. The object of the invention is to provide an apparatus for instantly stopping electrically driven apparatus in the event of



accident or other emergency. The apparatus operates to reverse the current through the motor so that it tends to rotate in the opposite direction or does rotate in the opposite direction and opens the electric circuit on the initial reverse movement of the driven apparatus so that all movement of the apparatus is arrested. The apparatus consists of a pole changing switch in the motor circuit which is held in position to close the forward driving circuit by a latch and which is provided with a spring for moving it to the reverse driving position when the latch is released. When the latch is tripped, the switch moves instantly into the reverse position, causing the motor to stop suddenly and reverse its direction, and thereby reverse the direction of rotation of the driven element. The switch is connected to the driven element so that the instant that its direction of motion reverses, the switch is moved to neutral position.

Apparatus for Fractionating Hydrocarbons

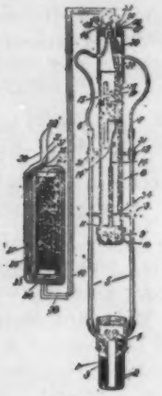
Patent No. 1,250,879, issued to Leon E. Hirt of Los Angeles, California, discloses a new method of and a new apparatus for fractionating hydrocarbon oils, by the use of the electric arc. The oil is first heated to vaporization and is



then flowed into a closed retort and maintained under controllable pressure and subjected to the action of an electric arc within the chamber. The arc breaks down the vapor into a plurality of fractionated vapors which are conducted from the chamber and condensed.

Water Heater

Patent No. 1,251,210, issued to Ida R. Forbes of Los Angeles, California, shows an electrical water heater employing a rather complex system of control. The heater consists of a tank in which is arranged an adjustable thermostat which



controls the circuit of an electro-magnet arranged externally of the tank. The electro-magnet is connected with circuit controlling means arranged in the heating element circuit, so that when the heating element has raised the temperature of the water to the point at which the thermostat is set, the electro-magnet is operated to open the circuit of the heating element.

Rectifier

Patent No. 1,251,269, issued to Harry A. Mulvany and Harry E. Kennedy of Berkeley, California, and assigned to the Electric Sales Service Company of San Francisco, discloses a novel form of rectifier. The device consists of a pair of electrodes, one of which is a metallic screen and the other of which is a pointed rod which is spaced from and pointed toward the screen. The pointed rod is heated to a temperature sufficiently high to establish a discharge of cathode rays from it toward the screen, and a current of air is blown over and through the screen to remove ionized air and metallic gases from between the electrodes, and to cool the screen. The screen is arranged over an aperture in a rotatable plate and vanes are provided on the rear side of the plate radiating from the aperture, so that when the plate is rotated a current of air is drawn through the screen.

SPARKS—Current Facts, Figures and Fancy

(A burglar alarm, an electrically served pipe line system which carried water to the armies in the desert, a barbershop device, and a new development in theater lighting, testify to the variety of uses to which electricity may be put. The future is going to bring its sad problems of the provision for those maimed in war, and the training of the blinded for certain branches of electrical work will play an important part in this country's work of reconstruction, as it has abroad.—The Editor.)

Had not electricity and engineering made passable the desert of Sinai, Jerusalem might not have been in Allied hands now. A broad-gage railroad line was laid over the desert and an American pipe line, fed by electric pumps, carried water from the Nile to the advancing troops.

* * *

A realization of the ups and downs of our world is obtained from that brief notice which reports aeroplanes as flying four hundred feet below sea level in the Dead Sea region. Of course, the Dead Sea lies 1292 feet below the surface of the Mediterranean, so that aeroplanes sailing 400 feet below sea level were still at an elevation of 892 feet.

* * *

Not many people in the electrical world realize that the patentee of the typewriter invented it for use as a punch in making raised characters on sheets of paper in finger-reading books by the blind. And the inventor himself certainly did not realize that two hundred years later China would be buying thousands of machines annually.

* * *

For the electrical man who has been wont to paint his electrical apparatus when the black enamel finish nicked off, with patchwork effect, the following mixture is suggested: Asphalt, one pound; lamp black, one-quarter pound; resin, one-half pound; spirits of turpentine, one quart; and enough linseed oil to make the lampblack into a paste before mixing it with the other ingredients. Mix thoroughly and apply with a varnish brush.

* * *

The modern barbershop, in war and in peace, has found good use for electricity. An electric light attachment to be used with a safety razor has recently been developed, complete with razor, trench mirror, strop handle and extra blades. The attachment can also be used to advantage with a pencil or fountain pen. A new electrically operated hair-clipper has been designed to save much of the barber's time. It is to be hoped it will at the same time trim a bit off the high cost of haircuts.

* * *

Several novel features were recently worked out in stage lighting by the Little Theater at Hollywood, Cal. Looking through the gates of the walled city the spires, domes, trees, etc., in the distance, constituted an important part of the plot. This was produced by fastening on the back of a white canvas screen a piece of brown wrapping paper cut to form the outline required. Upon this was directed a floodlight adjusted properly as to direction, intensity and equipped with color screens to obtain the color-quality desired. The silhouette produced imitated the city with light and shadows, evenly blended. Large Type C lamps in proper shades and diffusers, together with floods and color screens, were used.

* * *

A new use of electricity is being made by a separator company, which has installed a dust precipitator on its smokestacks, so that obnoxious particles in the smoke and fumes will not settle on the land in the vicinity of the zinc ore roasting plant. Incidentally, the dust thus saved is of value. The general scheme used for this purpose is to raise the voltage to about 100,000 volts and then rectify it and charge the equipment in the stack, which in turn charges the dust particles and causes them to precipitate in the bottom of the stack.

* * *

A burglar alarm, actuated by a sensitive selenium cell, which will sound a warning when illuminated by a match at a distance of 10 metres, is reported as a recent German invention. It can easily be concealed in a room and can be situated with its wiring at a distance from the valuables it is intended to protect, in an inaccessible position. As a burglar can hardly work without a light, the idea might prove feasible — with the obvious drawback that the owner would have to arise at dawn to prevent the alarm from waking him at sun-up.

* * *

Blinded soldiers are happy in finding that electricity offers another field for their limited talents. Several hundred men who received work shop practice in wiring, the use of simple tools, power house demonstrations, electrical and physical laboratory work, class demonstrations in the elements of electrical engineering and physics, the writing of reports, and an oral examination, are now engaged as electrical operators and substation attendants. Much has been done along this line in England, and similar work is being arranged for in this country.

* * *

Electrically heated gloves are suggested for the use of chauffeurs who must drive in excessively cold weather. The gloves have resistance wires set in the back, between two layers of thin sheet asbestos; connection is made to the electric light terminals at the most convenient points, and the fine flexible wires are attached to the wrist of the gloves by means of press-on buttons. The wires are of sufficient length not to interfere in any way with driving. When it is necessary for the driver to leave the steering wheel of the car, the wires can be instantly disconnected from the gloves merely by a pull on the press-button connections.

PERSONALS

Albert S. Schwabacher of San Francisco has been appointed federal fuel administrator for California. In his new duties, Mr. Schwabacher will pay especial attention to increasing the production and conserving the output of crude petroleum. Since California's production of fuel oil now falls short of a million barrels monthly in meeting the war service demands, Mr. Schwabacher's activities will be watched with the keenest attention by men interested in power generation in the West, since in the production of steam electric supply crude petroleum is of prime importance.

H. H. Jones, manager of the San Diego Light & Power Company, spent a few days in San Francisco recently.

Geo. L. Myers has succeeded C. R. Young as editor of the Pacific Power and Light Bulletin, of Portland, Oregon.

C. W. Chestnut, sales manager of the Western Electric Company, Seattle, spent a week visiting in Portland recently.

Edw. A. Bullis of the Federal Sign System (Electric) has gone to Philadelphia to take up work with the Wirth Electric Company.

George Hawley has been appointed resident engineer for the East Bay Water Company, in charge of the construction of the San Pablo dam.

H. J. Gille, sales manager for the Puget Sound Traction, Light & Power Company, Seattle, Wash., has returned from a business conference in New York.

Colonel E. E. Nash, treasurer of the Peerless Lamp Division of the National Lamp Works of the General Electric Company, is a recent visitor in Los Angeles.

W. R. Putman, division manager of the Utah Power & Light Company, Salt Lake City, Utah, has been made a director of the Utah Manufacturers' Association.

Leonard Metcalf, consulting engineer of Boston, Mass., is spending some time in San Francisco, where he is giving expert testimony before the Railroad Commission.

C. J. Tonjes, a mechanical engineer of Soerabaia, Java, and **B. B. Braat,** a manufacturer of electrical machinery of the same locality, are recent visitors in San Francisco.

E. M. Dobb, manager of the lighting fixture department of the Capital Electric Company of Salt Lake City, has been a visitor in San Francisco during the last few days.

T. A. Barton of the lighting department, General Electric Company, Schenectady, visited Seattle recently and inspected substations and power plants in that vicinity.

J. A. Royster, electrical inspector for Martinez, Cal., for the last three years, is master signal electrician of the 332nd Field Signal Battalion, stationed at Camp Lewis, Wash.

James F. Pollard, formerly with the engineering staff of the California Railroad Commission, is now manager of the commercial department of the Sierra and San Francisco Power Company.

W. D. McDonald, district manager at Seattle, Wash., and **C. W. Davis,** district manager at Dallas, Texas, both of the Westinghouse Electric & Manufacturing Company, are San Francisco visitors.

Lester H. Hibbard has left Los Angeles to accept a position with the Stone & Webster Engineering Corporation, in connection with the construction work this concern is doing in France for the federal government.

A. D. West, general manager of the Southern Sierra Power Company, was a recent visitor in San Francisco, where he attended the meetings of the Railroad Commission.

Allen Hazen, the well-known hydraulic engineer of New York City, is at present in San Francisco, where he is testifying as a valuation expert in the Spring Valley rate case.

M. A. Bray, who has had an important part in the handling of the railway construction work for the Pacific Power & Light Company of Portland, Oregon, has recently resigned.

J. A. Cranston, district manager of the General Electric Company northwest offices, Spokane, Portland and Seattle, with headquarters at Portland, spent three days in Seattle recently.

W. D. Kohlwey, of the Kohlwey-Smith-Alfs Electric Co., San Francisco, was a recent Portland visitor. While there he called a meeting of the Pacific division of the National Contractors' Association.

Robert Nowland, of the San Diego Consolidated Gas & Electric Company, San Diego, Cal., has resigned from his business connection to join the U. S. Aviation Corps, and is now in training at Foggia, Italy.

Burton R. Stare, of the Burton R. Stare Company, dealers in electrical apparatus and specialties, Seattle, is making a trip to the East which will take him to Chicago, St. Louis, Pittsburg and New York.

M. L. Kilbourne, present branch manager of the Shipowners' Radio Service in San Francisco, has been transferred to Seattle to take charge of the office at that point, and will have the title of division superintendent.

Frederick W. Johnson of the Puget Sound Traction, Light & Power Company, has been appointed assistant to E. C. Macy, in charge of construction work for Stone & Webster in the northwest, with headquarters in Seattle.

A. L. Strickland has been appointed district manager for the Pacific Power & Light Company at Seaside, to take the place of **Harlow Moore,** who resigned to accept a position with the Board of Fire Underwriters in Portland.

Emmett N. Britton, the youngest son of John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has been promoted from second lieutenant to first lieutenant in the 363rd Infantry at Camp Lewis.

R. H. Walker has resigned as secretary of the Electric Heating and Manufacturing Company, and as vice-president of the Electric Sales Corporation, Seattle, and has severed his connection with these companies. Holdings of Mr. Walker have been taken over by **P. F. Apfel,** president of the Electric Sales Corporation. **A. M. Stevens** has been chosen to succeed to the offices and trusteeships heretofore held by Mr. Walker.

John Cushing Stone, formerly assistant traffic manager of the Northern Electric Railway, has been appointed traffic manager of the Central California Traction Company, succeeding Major E. L. Stern. Mr. Stone will assume his new duties March 1st, and he will have headquarters at Stockton, although considerable of his time will be spent in Sacramento. Mr. Stone has spent his entire life in railroading, having served the Southern Pacific Company in its general freight office in various capacities, and later was promoted to traveling freight agent at Stockton. Later he was district freight and passenger agent for the same company in Sacramento. After leaving the Southern Pacific, Mr. Stone for two years was general freight and passenger agent for the Hilo Railroad Company of Hilo, Hawaii. He returned to California in July, 1914, to enter the traffic department of the Northern Electric Railway.

George L. Hedges has resigned his position with the Kelman Electric & Manufacturing Company of Los Angeles to report to Washington, D. C., for active duty as first lieutenant in the Officers' Reserve Corps, Ordnance Department.

A. C. Bradley, superintendent of the northern division of the Pacific Electric Railway, Los Angeles, Cal., has also been appointed superintendent of the eastern division of the company, to succeed G. P. Grotholdt, the two divisions being consolidated.

Roy C. Taylor, for the last ten years secretary to Franklin T. Griffith, president of the Portland Railway, Light & Power Company, has resigned to join the legal staff of Griffith, Leiter & Allen, attorneys for the Portland Railway, Light & Power Company.

C. B. Cooper, general superintendent of the Shipowners' Radio Service, a subsidiary concern of the Kilbourne & Clark Manufacturing Company, Seattle, has been chosen manager of the New York office of the latter concern, but still retains the old position.

L. K. Cushing, secretary of the Illinois Electric Company of Chicago, has arrived in Los Angeles, where he will spend some weeks in the Southwest. Mr. Cushing reports that the climate is good and that he is enthusiastic over the prospects in the Golden State.

James D. Blackwell, now a candidate for the city council of Seattle, was at one time chief engineer and superintendent of construction for the Seattle Electric Company. More recently Mr. Blackwell has been connected with the firm of Hanford & Blackwell, civil and consulting engineers.

W. W. Briggs, general agent of the Great Western Power Company, has resigned in order to accept an executive position with the Westinghouse Lamp Company. Mr. Briggs leaves shortly for the East, and his many friends in the West wish him all good fortune in his new field of activity.

Charles H. Rattray, construction engineer for the General Electric Company, recently returned to Seattle from China and Japan, where he installed machinery and inspected shipbuilding plants in the latter country. On his way back he visited Honolulu and viewed the volcano Kilauea near that city.

D. W. Pontius, traffic manager of the Pacific Electric Railway, of Los Angeles, Cal., has been appointed general manager of the San Diego and Arizona Railway, with headquarters in San Diego, Cal. Mr. Pontius began railroad work 25 years ago in Ohio as supervisor of track on the Pennsylvania system.

Joe Madden of the electric distribution department of the Pacific Gas & Electric Company, who has been chief electrician on the battleship "Oregon," has been transferred to the "New Mexico," which has the reputation of being the biggest battleship afloat. He will serve as chief electrician on this monster of the seas.

M. J. Perrin has been appointed manager of transportation of the San Diego Electric Railway, Point Loma Railroad and San Diego and Coronado Ferry Company, of San Diego, Cal. The position of superintendent has been abolished. All departments having heretofore reported to the superintendent will hereafter report to the manager of transportation.

A. L. Valentine, superintendent of public utilities, **J. J. McCullough,** in charge of the unified management of the Seattle Railway terminals, and **Guy A. Richardson,** superintendent of the Puget Sound Railway, Traction, Light & Power Company, are members of a committee specially appointed to care for the transportation situation in the Northwest, now extremely congested owing to the phenomenal growth of the shipbuilding industry.

Carl Johnson, son of Chas. P. Johnson of the Johnson Washing Machine Company of San Francisco, was severely wounded recently in the trenches in France. Particular significance is attached to the message of Johnson's injury by reason of the fact that he was a drafted man, taken into service last November and sent to Camp Lewis. It indicates the rapidity with which men are being sent forward into the war zone for actual service.

Some California soldiers at Camp Funston. The man with the X under him is Lieutenant W. H. Johnston of the San Francisco Stock Maintenance Division of the Western Electric Company.

F. W. Taylor, general purchasing agent of the Pacific Electric Railway, of Los Angeles, Cal., has been appointed purchasing agent of the Southern Pacific Company, of San Francisco, Cal. He has been with the company since the consolidation of the lines in 1911. For 25 years Mr. Taylor was general storekeeper for the Oregon Short Line, at Pocatello, Idaho, and while acting in this capacity was busy in getting a line on standardization of railway materials and where to save.

D. C. Jackling, San Francisco, who has been given charge of facilities for supplying explosives needed by the government, will supervise the construction of a government powder plant near Nashville, Tenn., estimated to cost $60,000,000. Mr. Jackling was formerly managing director of the Utah Copper Company, and in a similar manner controlled extensive mining and milling operations in Arizona and New Mexico. In these operations he directed large forces and provided electric power on a big scale.

J. R. Tomlinson, secretary-treasurer of the Pierce-Tomlinson Electric Co., left for St. Louis on January 18th to attend a meeting of the National Executive Committee in company with W. D. Kohlwey of San Francisco. Mr. Tomlinson had to leave on short notice, as S. C. Jagger, the regular Ore-

W.S.S.
WAR SAVINGS STAMPS
ISSUED BY THE
UNITED STATES
GOVERNMENT

THRIFT STAMPS

Patriotic citizens by the thousands are subscribing to the war savings stamps issued by the United States Government. An average of twenty dollars per capita —twenty dollars for each man, woman and child in America—is asked during 1918 from this source. The putting across of this splendid scheme is most helpful to the government at this critical period in our national life, and at the same time it is the most remarkable plan for encouragement of thrift among the young and old ever initiated. Are you doing your part?

gon member of the committee, found it impossible to attend. Mr. Tomlinson has been identified in the past with the national movement and was the state chairman on Permanent Organization.

J. I. Colwell and **Harry Byrne** of the North Coast Electric Company, Seattle, have returned to Seattle after attending the quarterly meeting of the Pacific Coast Section of the Supply Jobbers' Association, held at Del Monte, California, January 24, 25 and 26. Mr. Colwell was accompanied by Mrs. Colwell, who will visit relatives at Pasadena for several weeks.

J. F. NePage, of the NePage-McKenny Company, spent some time recently in Portland. Mr. NePage represented the Washington association at the meeting of the Pacific division and was elected one of the executive committee men from this division, but owing to unforeseen circumstances it was impossible for him to attend the present meeting at St. Louis.

William Gerig has been appointed as engineer in charge of the Anchorage Division of the Alaska Railroad, under the supervision of William C. Edes, chairman of the Alaskan Engineering Commission. Mr. Gerig has been for the past two years with the commission in the capacity of consulting engineer, and previous to that time had been for many years vice-president and chief engineer of one of the Hill lines in the Northwest, and had been for some time with the Panama Canal as engineer in charge of one of the construction divisions.

H. J. Hanzlik, chief engineer of the Kerr turbine engine plant at Wellsville, N. Y., designer of the marine engine that factory has begun building, spent several days in Portland recently to be present at the official trial trip of the steamer Westward Ho, installed in which is the first Kerr marine turbine to be tried out in the United States. The Port of Portland dredge Tualatin has a Kerr turbine engine and many of them have been used in shore plants, but it was not until the war was precipitated that the manufacturers turned to propulsion engines.

Major Frederick Mears, who has been for the past three years a member of the Alaskan Engineering Commission and in charge of the work at Anchorage, has been relieved at his own request of the duties in connection with that position. Major Mears had been specially detailed to the Alaska Railroad work from the War Department, but felt that in the present time of stress he should return to the army. The War Department is to commission him a colonel and place him in command of an engineering regiment which is to be engaged in railroad work in France.

George Fillmore Swain, professor of civil engineering in the Graduate School of Applied Science of Harvard University, will be the lecturer on the Hitchcock Foundation for 1918, according to announcement at the University of California. Professor Swain, a graduate of the Massachusetts Institute of Technology, has been consulting engineer for the Massachusetts Railroad Commission and for the Boston Transit Commission. He is at present chairman of the Railroad Commission of Massachusetts. He has been engineer for many large structures and has been a member of many commissions where his technical skill and business judgment have been required.

George C. Holberton, for many years manager of the San Francisco District of the Pacific Gas & Electric Company, has retired from service with the company in order to devote himself more fully to his large private interests. **H. A. Bostwick,** assistant to the first vice-president, has been put in charge of the San Francisco District with the title of general agent. **H. P. Pitts,** formerly head of the industrial department, now becomes manager of the commercial department of the San Francisco District, **J. E. Murphy** is made manager of the collection department, **F. E. Oldis,** superintendent of bookkeeping, addressograph and records, while **S. J. Lisberger,** as previously announced in the columns of the Journal of Electricity, is superintendent of electric distribution of the San Francisco District.

OBITUARY

E. A. Heron, who was president of the Oakland Traction Company, of Oakland, Cal., before its reorganization as the San Francisco-Oakland Terminal Railways, died recently at his home in Oakland, Cal, after a short illness. Mr. Heron was born in Galena, Ill., 65 years ago.

Dr. Frank W. Thomas, president of the Pomona Valley Telephone & Telegraph Union, of Pomona, Cal., died recently.

The Portland Convention of the Northwest Electric Light and Power Association

During the winter months while considerable activity and planning is under way in the southwest, especially in California, looking toward the successful consummation of the Del Monte convention of the Pacific Coast Section, N. E. L. A., eyes in the northwest are beginning to turn toward Portland and its promise for a successful convention of the Northwest Electric Light & Power Association in September. Under the able leadership of Guy W. Talbot affairs in this association are in excellent status.

Guy W. Talbot is president of the Pacific Power and Light Company, Portland, Ore. Mr. Talbot was born in Centerville, Mich., on August 12, 1873, and was educated in

Guy W. Talbot, president Northwest Electric Light and Power Association

the public schools of Des Moines, Iowa, and the College of Emporia. He entered railroad work in Des Moines in 1891, following that occupation until March, 1910. During that time he was successively traveling freight and passenger agent for the Des Moines, Northern and Western Railway, traveling freight agent for the Iowa Central Railway, general traveling freight agent for the same road, traffic manager for the Peoria and Pekin Terminal Railway, from which position he was promoted to be general manager and later to be vice-president, serving in the latter capacity from 1900 to 1905; vice-president and general manager of the Astoria and Columbia River Railway Company and Corvallis and Eastern Railway Company in 1905, and from 1906 to 1910 vice-president and general manager of the Oregon Electric Railway Com-

pany. Since 1910 he has been president and director of the Pacific Power and Light Company, the Portland Gas and Coke Company and the Walla Walla Valley Railway Company, all with headquarters at Portland.

Northwest Electric Light & Power Association Committees Appointed

President Talbot of the Northwest Electric Light & Power Association recently appointed the following committees for the Association year 1917-1918:

Public Policy Committee—Franklin T. Griffith, president, Portland Railway, Light & Power Company, Portland, Oregon, chairman; H. L. Bleecker, vice-president, The Washington Water Power Company, Spokane, Washington; Elmer Dover, vice-president, H. M. Byllesby & Co., Tacoma, Washington; F. A. Harmon, manager, Eastern Oregon Light & Power Company, Baker, Oregon; John A. Laing, vice-president, Pacific Power & Light Company, Portland, Oregon; A. W. Leonard, president, Puget Sound Traction, Light & Power Company, Seattle, Washington.

This committee is probably the most important committee of the association outside of the executive committee, which is its governing board. It concerns itself with all questions of public policy as they pertain to the electric light and power industry and its scope is very general, taking into consideration the larger aspects of all branches of the industry, such as legislation, regulation, legal, executive, operating, technical, sales, etc.

Hydro-Electric and Technical Committee—Geo. E. Quinan, engineer, Puget Sound Traction, Light & Power Company, Seattle, Washington, chairman; R. M. Boykin, engineer, North Coast Power Company, Portland, Oregon; J. B. Fisken, superintendent, The Washington Water Power Company, Spokane, Washington; L. T. Merwin, general superintendent, Northwestern Electric Company, Portland, Oregon; F. D. Nims, chief engineer, Northwestern Power & Manufacturing Company, Port Angeles, Washington; H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, Oregon. This committee covers all technical matters. It has for some time past principally concerned itself with a consideration of overhead line construction rules and regulations of state commissions, and has had much to do in co-operating with the Bureau of Standards at Washington, D. C., in determining questions of standardization for purposes of service and safety. This committee has arranged to actively co-operate with the Pacific Coast section of the National Electric Light Association through the appointment of Geo. E. Quinan as a member of the Engineering Committee of that section, of which committee J. E. Woodbridge, of the Sierra & San Francisco Power Company, chairman, has been named a member of this committee.

Labor Study Committee—S. R. Inch, general manager, Utah Power & Light Company, Salt Lake City, Utah, chairman; C. S. MacCalla, vice-president and general manager, the Washington Water Power Company, Spokane, Washington; William H. McGrath, vice-president, Puget Sound Traction, Light & Power Company, Seattle, Washington. This is a new committee, the development into organization form of the investigation and research activities of Mr. Inch, to make comparison of wages, hours and working conditions in the territory covered by the association, to determine for the Utah Company conditions, more completely assuring the co-operation and continuity of service of labor, which has incidentally benefited the industry, but not in the serviceable form that will be the case when this committee gets to working officially. At this particular time the creation of this committee is of vital importance, owing to the difficulties that are constantly increasing in respect to labor problems as a result of the war and consequent diminishing supply of labor.

Electric Range Committee—W. R. Putnam, division manager, Utah Power & Light Company, Salt Lake City, Utah, chairman; M. C. Osborn, commercial agent, The Washington Water Power Company, Spokane, Washington; A. C. McMicken, sales manager, Portland Railway, Light & Power Company, Portland, Oregon. This committee is devoted solely to promotion of the development of the electric range industry. Questions pertaining to more universal use of the electric range were never more pertinent to prevailing economic conditions than at this moment. Where the nature of service is hydro-electric utilization of electricity for cooking is a positive aid to fuel conservation and more free and efficient operation of transportation facilities. The electric range is in a position to do its part in winning the war, and each company that encourages its use and each consumer is rendering a patriotic service in addition to increasing the earning condition of public utilities and giving cleaner and more convenient service to the consumer.

Program Committee—Lewis A. McArthur, general manager, Pacific Power & Light Company, chairman; Robert W. Clark, assistant sales manager, Puget Sound Traction, Light & Power Company, Seattle, Washington; C. P. Osborne, superintendent of power, Portland Railway, Light & Power Company, Portland, Oregon; George C. Sawyer, district manager, Pacific Power & Light Company, North Yakima, Washington. This committee concerns itself entirely with the preparation of the program for the forthcoming convention in September, 1918.

Entertainment Committee—C. R. Young, sales manager, Pacific Power & Light Company, Portland, Oregon, chairman; Geo. G. Bowen, sales manager, Northwestern Electric Company, Portland, Oregon; W. H. Lines, secretary to president, Portland Railway, Light & Power Company, Portland, Oregon; Carl L. Wernicke, manager, Westinghouse Electric & Manufacturing Company, Portland, Oregon. This committee has to do with providing entertainment for delegates to the annual convention.

WHAT THE SAD SEA WAVES SAY

While the work of the Northwest Electric Light & Power Association and the forthcoming Portland convention in September has been so interestingly outlined above for men of the electrical industry of the West, the call of the sea down at beautiful Del Monte is being heard. The importance of this war service convention of the Pacific Coast Section, N. E. L. A., April 24-27, 1918, is commented upon on the editorial page of this issue.

MEETING NOTICES FOR ELECTRICAL MEN

(The most important meeting of the past semi-monthly period has taken place at Portland, where the Pacific Division of the National Association of Electrical Contractors and Dealers has held a most helpful meeting. Plans for the September convention of the Northwest Electric Light & Power Association are outlined on the preceding page, while comment may be found in this issue on the editorial page concerning the Pacific Coast Section, N. E. L. A., Convention at Del Monte, Cal., April 24-27, 1918. Other meetings of interest are found on the following pages.—The Editor.)

Pacific Division of the National Association of Electrical Contractors and Dealers

The first meeting of the Pacific Division of the National Association of Electrical Contractors and Dealers was held at the Hctel Multnomah in the city of Portland, Wednesday evening, January 16, 1918. The following were present: W. D. Kohlwey, chairman of the National Affiliation for California; J. F. NePage, state chairman of permanent state organization and delegate to the Pacific Division for Washington; Samuel C. Jaggar, delegate to the Pacific Division for the State of Oregon; J. R. Tomlinson, state chairman of permanent organization; J. W. Oberender, secretary-treasurer of Oregon Association of Electrical Contractors and Dealers; Allan S. Halls, president Oregon State Association of Electrical Contractors and Dealers.

The meeting was called to order by W. D. Kohlwey, who presented to the meeting his authority from the National president, Robley Stearnes, for that purpose. Nominations and elections being then in order, W. D. Kohlwey was unanimously elected chairman of the Pacific Division of the National Association of Electrical Contractors and Dealers. Mr. Kohlwey thereupon assumed the chair and declared the meeting of the Pacific Division of the National Association of Electrical Contractors and Dealers open for the transaction of such business as might be properly brought before it.

On motion, duly made and seconded, J. W. Oberender was elected secretary-treasurer of the Pacific Division. The matter of election of two delegates as members of the National Executive Board was next considered, and the following were duly nominated, balloted upon and elected: One year term, Samuel Jaggar of the Morrison Electric Company of Portland, Ore.; two year term, J. F. NePage of the NePage-McKenney Co., of Seattle, Wash. The two delegates, together with the delegate at large, W. D. Kohlwey, appointed by the National president, were instructed to attend the National Executive Board meeting in St. Louis, January 22nd. It was decided to hold the next semi-annual meeting of the Pacific Division at the city of San Francisco, the exact date to be determined later.

A. I. E. E. Midwinter Convention

The Sixth Annual Midwinter Convention of the American Institute of Electrical Engineers will be held February 15 and 16, in the Engineering Societies Building, New York.

On account of war conditions the Meetings and Papers Committee, with the approval of the Board of Directors, has decided to make this convention purely a business meeting, and therefore no entertainment features or excursions have been included in the program.

The session on Friday morning will be devoted to the subject of Circuit Breaker Ratings. That of Friday afternoon to Meters and Measurements. The Friday evening session will be devoted to a lecture by Dr. A. C. Crehore, followed by discussion. This session will be of general interest to everyone, as the subject will be presented in a popular and non-technical manner. The session on Saturday morning will be devoted to the subject of Alternating Current Commutator Motors.

The San Francisco Electrical Development League

January 30, 1918, at the Palace Hotel, saw the joint meeting of the league members with the civil engineers of the San Francisco bay region. The meeting was well attended, Allen Hazen and Leonard Metcalf, two noted engineers of the East, being among those present.

H. J. Brunnier, structural engineer, and vice-president San Francisco Association, A. S. C. E., gave an introductory talk on "Co-operation between Civil Engineers and Electrical Men." Chas. D. Marx, professor of civil engineering at Stanford University, and past president American Society of Civil Engineers, spoke on "The Relation of Technical Training to Wartime Activities." Chas. G. Hyde, professor civil engineering department, University of California, talked of "The Relation of the University as an Institution, to Wartime Activities."

Nathan A. Bowers, Pacific Coast editor of the McGraw-Hill Company, and secretary of the San Francisco Association, A. S. C. E., acted as chairman of the day.

With an old-time record of the "Star Spangled Banner" on a pioneer phonograph, the Edison Day of the Electrical Development and Jovian League, on February 6th, was fittingly celebrated. The occasion was in honor of the seventy-first birthday of the noted inventor. E. M. Cutting, Pacific Coast manager of the Edison Storage Battery Company, as chairman of the day, introduced Frank Fagan, Pacific Coast manager Edison Lamp Works, who gave a brief review of Edison's wonderful progress. This was followed by motion pictures showing the early indications of inventive genius in the boy, and the later determination which has been so large a factor in Mr. Edison's success. The meeting was a large and enthusiastic one, and in view of the splendid type of American citizen represented in the life work of Mr. Edison, each went from the meeting with a firm resolve to do his bit for the nation in a more effective maner.

Portland Section, A. I. E. E. and N. E. L. A.

The joint meetings of the Portland Sections of the A. I. E. E. and N. E. L. A., were held in the Multnomah Hotel on Tuesday evening, February 5, 1918, at 8:00 p. m. This was

BUILDERS OF THE WEST—XXIII

EPES RANDOLPH

The closing of the Colorado River break—an almost insurmountable feat of engineering in the district of the Salton Sea in the Southwest—and the building of electric lines out into the stillness of a waste having alone this eternal characteristic as its claim to greatness, but later to become the feeders for a population of an empire, have been two mighty tasks that one constructive mind foresaw with an accuracy in accomplishment that has been a potent factor in the upbuilding of the West. To Epes Randolph, engineer and builder with the Pacific Electric Company in Southern California, this issue of the Journal of Electricity is affectionately dedicated in appreciation of his mighty accomplishments.

ladies' night and after a short talk by Professor Morgan of Reed College on "Chemistry and the War," the members and their guests participated in a dance, during which refreshments were served.

Professor Morgan said in part that during three years the output of chemicals in the United States has increased from six million pounds to 1,250 million, exclusive of explosives. Dye stuffs have increased since 1913 from 333 million pounds to 1,200 million pounds, or 80 per cent of all used. After the first gas attack of the Germans, the English furnished a million gas masks to their troops in the space of four days, and England now is spending $125,000 per day for chemists to work on gas and flame chemicals. Nitrogen can not be obtained in the United States for one-fourth what it costs the Germans to manufacture it. Potash is the most difficult problem, however, and has not been solved for the Allies. Only about 25 per cent of the demand has been produced, Germany controlling the world's only natural supply. Among the substitutes which the war has called forth, a new alloy of magnesium and aluminum has been developed in Germany to take the place of copper. Germany's greatest remaining need is fats. The only vegetable that will grow in Germany from which oil can be obtained is sunflowers, and they are planting an immense amount of this flower. They are is made into a substitute for rubber. Nettles, willow bark, and paper are used in making cloth. Chemistry has done more to keep life in people than the use of explosives has killed. Without disinfectants, for instance, modern surgery would be impossible. There would, in fact, be no civilization on earth today were not not for chemistry.

About 50 couples attended the lecture and party.

Alameda County Electrical Club

The Alameda County Electrical Club held its election at the last regular meeting at Hotel Oakland.

George Drew of the Pacific States Electric Company was elected president, Lee Gilpin of the Piedmont Electric Company vice-president, and George B. Furmiss of the Pacific Gas and Electric Company secretary-treasurer.

The retiring officers were given a vote of thanks for their work during the past year, and George Drew gave a very interesting talk on past activities and asked that the boys get together and make this the banner year. In order to obtain greater co-operation among the electrical men a committee was appointed to confer with the Electrical Contractors and Dealers. It is hoped that the next meeting of the club, which is to be held on February 21st, will be largely attended by electrical men from both sides of the bay. Some prominent speaker will be present and an interesting program will be held.

HAPPENINGS IN THE INDUSTRY

Changes and Beginnings

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a service station at 535 First Avenue South, Seattle, from which to handle service in the State of Washington and the Northwest. It announces, also, the removal of its Seattle sales office to the location given herein, to continue in charge of C. Kirk Hillman.

The C. A. Smith Company of Marshfield, Ore., is finishing the foundations and preliminary work for installing electric equipment which will double their present output.

The machinery for the second unit of the plant, costing about $80,000, has been enroute here from Schenectady, N. Y., since the latter part of December and the several cars containing it should arrive any day.

New Power Loads

Colorado Power Company reports that power contracts signed up in 1917 aggregated 10,497 horsepower with an estimated annual revenue of $350,912. The net gain in new business for the year was 7,024 horsepower with an estimated annual revenue of $242,235. On December 31 new business under contract not yet connected, aggregated 4,130 horsepower with estimated annual earnings of $152,400. According to the company's estimates, this business will all become productive of revenue by the end of September, 1918.

The large government spruce cut-up plant was opened in Vancouver, Wash., recently. It is the largest plant of its kind in the world and will furnish much of the spruce which will go to make America's fleet of aeroplanes.

New Business

McDonnell & Company of San Francisco, Cal., are distributing a circular dealing with the Poulsen Wireless Corporation. The patent originally introduced in this country from Denmark has been amplified by L. F. Fuller. The system has been adopted by the United States government at Cavite, Philippine Islands, for a plant nearing completion. The French government has closed a contract with the corporation for what is described as the most powerful wireless installation in the world.

The Electric Sales Corporation, Henry building, Seattle, has secured exclusive manufacturing and selling rights for the Lindberg Electric moisture vaporizer for eliminating the "freezing" of pneumatic tools, such as riveting machines, pneumatic drills and other tools. It is estimated that the installation of the Lindberg vaporizers will save thousands of dollars to the shipyards.

William A. Mullins Electric Company, 931 Broadway, Tacoma, has the contract for installing Brascolite fixtures in the billiard room at Camp Lewis. This is said to be the largest billiard room in the United States.

The Northwest Electric Company, 760 Commerce street, Tacoma, Washington, H. F. DeWeese, manager, reports much activity. The company has completed the wiring in the 1800 buildings at Camp Lewis with the exception of the Y. M. C. A. buildings, the Cassidy & McKee buildings and the theatre building. It also did the complete wiring in the Lynn undertaking parlors on Tacoma avenue, building of the Griffith Motor Car Company on Broadway and the plant of the Tacoma Shipbuilding Company.

A. H. Cox & Company, 307 First Avenue South, Seattle, are installing a unique equipment for the United Coal Sales Company at Railroad Way and Florida street. The purpose is to operate 60 horsepower traveling hoist by a trolley system which must be kept within a maximum of 14 inches from the dock. As there was no chance to get under the dock, a rather odd system consisting of heavy wooden screws to protect the trolley system from the water and to guard against personal injury was installed.

Personal Items

Stephen M. Cronk, Seattle manager Otis Elevator Co., reports the closing of contracts with Hans Pederson, general contractor, for the sheet metal shop No. 102 at Bremerton navy yard, to install an electric freight elevator by March 15th. He has also contracted to install a hydraulic elevator in the temporary store house now being erected by Erickson & Larson, same to be ready by March 1.

H. H. Manny, manager of the Seattle office Baker-Joslyn Company, 526 First Avenue South, announces that the company has taken on the complete line of conduit and marine fittings of the V. V. Fittings Company of Philadelphia and now represents this concern on the Pacific coast.

J. C. Manchester is now district sales manager for the Economy Fuse & Manufacturing Company, San Francisco.

Mr. Manchester was formerly connected with the Interstate Electric Novelty Company in that city.

A. B. Hill was recently reelected president of the Petaluma Power & Water Company; Thomas Maclay as vice-president; F. D. Ellsworth as secretary and superintendent, and the Petaluma Swiss-American Bank as treasurer.

J. A. Hoskins of Baker, Ore., recently was awarded the contract for the construction of the drainage system on the Ontario drainage project at a figure approximating $150,000. In company with L. R. Stockman, of this city, consulting engineer on the project, he will go to Ontario next week to arrange for beginning work.

Robert Bailey has purchased the Morton Telephone Company. He is to make immediate repairs and rebuild the plant almost entirely in the spring.

Reclamation Heads Meet

Managers of the 32 reclamation projects under government control met recently in Denver for an annual conference with A. P. Davis, Director of the reclamation service, and other service officials. Increased food production through bringing into cultivation lands on the projects for which water now is available, conservation of water, improved distribution systems and general irrigation and drainage problems made up the program. Virtually every western state was represented at the meeting.

Olympia Gets New Rates

The Olympia Light & Power Company, Olympia, Washington, has filed with the state public service commission a new rate schedule, increasing the rate to be charged but lowering the present combination rate for residence lighting, heating and cooking with electricity. The intended schedule of rates increases the maximum charges to power users from 50 cents to $1 and raises the rate to be charged by approximately 20 per cent. This will have its effect on the shipyards, iron works, printing plants and other users of electric motors. Present residence lighting is unchanged but the new combination rate for lighting, heating and cooking by electricity is to be 12 cents for the first four kilowatt hours, eight cents for the following 12 and three cents for all after that.

Household Electrical Appliances to be Standardized

The national movement for the conservation of time, labor, food and fuel is adding an impetus to the already exceptional demand for household electrical appliances.

To more rapidly popularize these appliances, the Edison Electric Appliance Company, recently merged from the General Electric Company (appliance department), Hughes Manufacturing Company and the Hotpoint Electric Heating Company, has organized a development committee.

This committee, which is composed of the best electric heating talent of the three companies, will operate at the various plants of the Edison Electric Appliance Company during 1918, beginning its work at the Ontario, Calif., plant and continuing its investigations there until February 15th.

It will be the work of this committee to discard the undesirable and retain the desirable points developed in the practice of these three companies, blending with their work the ideas received from the trade in regard to the requirements of the buying public.

To further this work, the development committee invites the co-operation of the men in the field who are selling and installing these appliances. It wants suggestions and criticisms naturally born of experience with the buying public. Most particularly it wants to know the needs mechanical and electrical, from a selling standpoint, and what the user wants in the way of utility and appearance.

With the full co-operation of the trade, it is fair to prophesy that the near future will see a rapid development in the electric appliance industry.

Readers of the Journal who will co-operate in this work should communicate with C. P. Randolph, who is chairman of the development committee, at 5660 Taylor street, Chicago.

Traction Club Meeting

The Stone & Webster Club held its mid-winter meeting and dinner in the Labor Temple Annex, Seattle, on the evening of January 30. One hundred and sixty members were in attendance. President Alton W. Leonard; Vice-president William J. McGrath of the Puget Sound Traction Light & Power Company; Manager L. B. Dean of the Tacoma Railway & Power Company; Manager Donald S. Barnes of the Everett Railway & Power Company, with Fred S. Pratt, chairman of the Board of Directors of the Puget Sound Traction Light & Power Company were in attendance as guests. George E. Quinan, engineer of the company and president of the club, presided.

NEW BULLETINS

Trade Catalogues

The Ductometer, a chart for use in connection with ventilating systems, is the subject of a brief bulletin recently gotten out by R. D. Ward and Geo. P. Bender of New York.

An attractive bulletin recently published by the Trumbull Electric Manufacturing Co. lists and describes their various types of enclosed switches.

Brascolite Catalogue

Not only does the new Brascolite catalogue describe Brascolites, but it also tells about certain of the other Luminous Unit Co. products, namely, Industrolites, their factory fixture; the Projectolite, a flood-lighting unit, and the Aglite glass products. The white porcelain enameled switch plates are of particular interest. The rear of the booklet is devoted to a code which may be used in transacting business with the company by telegraph. A diagram for determining spacing or mounting height of Brascolite fixtures when either factor is known, has also been included.

The Upbuilding of the Industry

The National Electrical Safety Code (Circular No. 54) issued by the United States Bureau of Standards, Washington, D. C., covers all points relative to the safety of human life in the various classes of electrical construction.

A thirty-two page booklet covering general construction safety orders, effective January 15, 1918, has recently been issued by the Industrial Accident Commission of California.

The annual report of the Chief of the Bureau of Foreign and Domestic Commerce for the year ending June 30, 1917, has just been given out. Two investigations in the field of electrical equipment, machinery, and supplies were conducted during the year. The men appointed for this work were P. S. Smith, formerly in the export department of one of the largest electrical companies, whose investigation of Latin American markets started in the previous fiscal year, and R. A. Lundquist, well known as an engineer and writer on power transmission and other technical subjects, who reported in August, 1916, for Far Eastern work. The far eastern investigation covers power-generating equipment, transmission and distribution materials and equipment, motors and control equipment, electric railway equipment and electric locomotives, combined power plants, meters, lamps, batteries and battery plants, telephone and telegraph equipment, wiring supplies and electric fixtures, electric ranges and other heating appliances, medical and dental apparatus, and various miscellaneous apparatus.

LATEST IN EVERYTHING ELECTRICAL

(The possibilities of mechanical heat regulation have tempted experimentation, so that at one time or another many devices for governing temperature changes have been placed on the market. A new instrument, adjustable for use with hot air, steam or hot water furnaces, has recently been gotten out and may be used either with dry batteries or directly connected to the house wiring. An ingenious "new wrinkle" tap is further described and notice is made of the government need for skilled workers.—The Editor.)

Heat Regulator

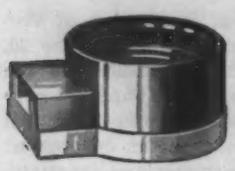
A new heat regulator gotten out by the Western Electric Company will maintain an even temperature in the house, thus adding to the convenience and health of the household. It prevents the overheating of the furnace and the wasting of fuel. It permits the maintaining of a comparatively low temperature at night; and at a predetermined hour in the morning will automatically open the drafts and the awakening household will find a comfortably warm house. There is no danger of the house being overheated. A thermostat is mounted on the wall on the first floor. Connected to this is a cable running to a motor in the basement. A change of the room temperature on the first floor of one degree causes an electrical impulse to be sent to the motor box and the drafts will be opened or closed as required. It replaces the human element in heat regulation. It will regulate the underfeed draft and the check damper of either hot air, steam or hot water furnaces. It can also be applied so as to govern the main valve on gas, municipal or community steam heating plants.

Recording dial of the regulator

For the home that is not wired there is the No. 100 type. Two cells of dry batteries furnish the current for the electrical impulse from the thermostat to the motor box. The motive power for operating the drafts and dampers is furnished by a substantial spring motor.

A Novel Canopy Tap

The Bryant Electric Company of Bridgeport, Conn., have added to their "New Wrinkle" line of wiring devices a novel canopy tap of wide application which can be readily attached to any ceiling or side wall fixture where a current tap is desired.


A "new wrinkle"

The new tap receives any "New Wrinkle" body and many useful combinations can be made. For instance, by wiring across the line and using in conjunction with a "New Wrinkle" Keyless, keyed or pull chain socket, an additional outlet is provided for an Edison plug flexible cord attachment to a fan, portable lamp or other device; or any additional "Spartan" outlet can be provided by using the canopy tap and a "Spartan" 29 plug receptacle.

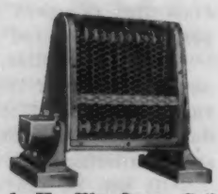
The new device which is known as the "BZ New Wrinkle Canopy Tap," is National Electrical Code Standard and consists of a "New Wrinkle" ring and a porcelain base which are easily and firmly attached to the outlet box by means of a stamped steel ring, rings being made to fit 3¼ inch and 4 inch boxes. In lath and plaster construction, the rings are omitted and the base attached by wood screws. After notching the canopy to fit over the neck of the tap it can then be replaced flush with the ceiling or wall, resulting in a neat and unobtrusive job.

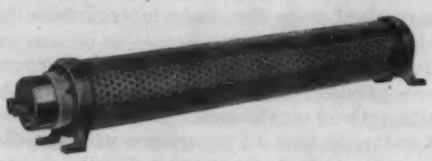
Combined with a pull switch

Electric Air Heaters

C-H Electric Air Heaters are designed to supplement the furnace or steam heating system in the home, office, factory or large industrial plant.

Grid type Mill Heater 5 K. W., widely used where heat "without frills" is desired


1 K. W. Open Coil type heater—small and neat—easily portable.


1 K. W. "H" Unit type heater takes little space—can be operated at three heats

In the home or office electric heaters are particularly useful in the raw days of late fall or early spring, when the main heating plant is not in operation and in such uses they affect a distinct saving in coal. They can be used to advantage in the winter time to make more comfortable a room that is hard to heat.

Large industrial plants and factories find electric air heaters useful in heating crane cabs, outhouses, valve, pump and meter houses, exposed remote corners or rooms, watch or signal towers, for shearmen and tablemen in steel plants in theatre ticket booths as well as for scores of miscellaneous applications. Flexible electrical conductors will carry electrical heat cheaply and efficiently to the most inaccessible points.

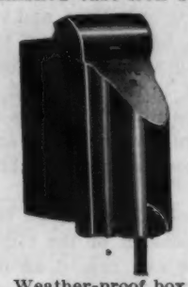
The "H" unit type consists of standard C-H Space Heater Units each about the size of a two foot rule. The units are mounted horizontally with the flat side in a vertical position in order to give the best circulation when the heater is used on either wall or floor.

The Open Coil Type built to meet the rigid specifications of the United States Navy and used extensively on board ship has the resistor wound in the form of an open coil over asbestos cord on porcelain supports. This type and the "H" unit type are both handsomely finished and are particularly designed for use in the home or office.

The Grid or Mill type consisting of standard grid is designed for industrial use where heating "without frills" is desired.

New V. V. Type "R" Receptacles, Plugs and Boxes

A new heavy service receptacle mounted in a neatly finished cast iron box was recently placed on the market by the V. V. Fittings Company, Philadelphia. The box is weatherproof, arranged with a gravity closing lid which remains closed whether the plug is in or out. The receptacle is made of heavy slate thoroughly insulated from the box. The receptacle sets at an angle in order to permit an easy connection and disconnection of the plug. The binding posts for connecting wires are easily accessible and plenty of room is allowed for wiring. The plug is made of wood so as to stand rough handling and is arranged so that the polarity cannot be reversed.



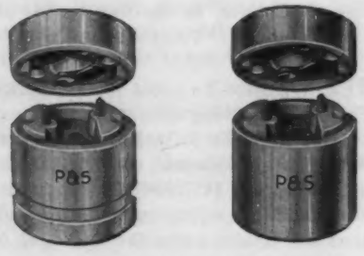
Weather-proof box

3 Pole receptacle

The complete outfit is made in 2, 3 and 4 pole for 30 and 60 ampere capacities. It is made especially for outdoor work for use with portable motors, coal hoists, shipyards, boat loading machinery, moving picture machine outlets, etc.

Two-Piece Porcelain Sockets for Reflectors

P&S 1233, a two-piece porcelain socket without shade-holder groove, and its companion piece, P&S 1234 with shade-holder groove are placed on the market by Pass & Seymour, Inc., to meet the requirements for heavy-duty sockets for medium or normal-base type "C" lamp fixtures. These receptacles have ample wiring room or clearance for a single



Porcelain sockets for reflectors

or double pair of wires in the terminal hood which may be supported by substantial machine screws, spaced 1 3-16 inch on centers.

These receptacles are entirely front-connected and the socket-body is easily positioned by the aid of heavy porcelain tenons.

All live parts, where necessary, are sealed in with a special compound which will successfully resist the extreme temperature to which the devices may be subjected in use.

MISCELLANEOUS NOTES

On Fuel Saving

Southern Pacific enginemen are in receipt of pledge cards from United States Federal Fuel Administrator for California Albert E. Swabacher calling on them to save fuel. The Southern Pacific is the greatest consumer of fuel oil in the state and the co-operation of its employes is expected to mean in the aggregate a vast saving for other industries. Following are the contents of the pledge card:

1. Keep on time. It is more economical to keep up than to catch up.
2. Make no unnecessary stops.
3. Take water as quickly as possible.
4. Watch fuel performance on each trip and report excessive consumption.
5. Co-operate to the fullest extent with the other man in the cab, dispatchers and train crew.
6. See that no oil is wasted when filling tank of engine.
7. Report promptly any waste of oil that you may notice in connection with your work or otherwise.
8. All work in connection with the pledge cards to the engineers and firemen has been under the direct supervision of Walter J. Samson, chairman of the Conservation Committee for the Federal Fuel Administration for California.

Shipyard Workers Wanted

Among the 79 occupations that are employing men needed for ship and machine work during the war are: Mechanical draftsman, electrician, electrical wireman, electric welder and power engineer. All individuals skilled in one or more of these branches are asked to enroll in the United States Shipyard Volunteers of the Public Service Reserve. Blanks giving questions that must be answered may be obtained from the chairman of the County Council of Defense.

Call for Electricians

Three hundred men are wanted for the 37th Engineers. The work of the unit will be to furnish electricity to the troops in France. Every man must be an expert in his line.

California Water Commission Applications

The Sespe Light & Power Company of Los Angeles has applied to the State Water Commission for permission to appropriate 60,000 acre feet of the waters of Piru Creek, tributary to the Santa Clara River in Ventura county for irrigation purposes. The only works specified in the application is a main canal 18 miles in length. Six months has been asked in which to complete the application.

Two separate applications have been filed with the State Water Commission by the Southern California Edison Company in connection with the development of its power projects. One application involves the impounding of the waters of Pitman Creek in Fresno county and the other the waters of Salmon and Horse Creeks in Tulare county. It is proposed to store the waters of Pitman Creek and divert a portion of same to Big Basin Reservoir, on Big Creek, and the remainder directly into conduits leading to power plants below. The estimated cost of the dam and the conduit line to Big Basin Reservoir is stated at $842,900. In connection with this application, the Southern California Edison Company is successor to the appropriations of water and the property of the Pacific Light & Power Corporation. Two plants have been already installed on Big Creek, known as Big Creek Power Plants Nos. 1 and 2, and the company proposes to construct two additional plants below these. The water after use in the four plants is to be returned to the San Joaquin River from the tail-race of Plant No. 4 in Madera county. The application sets forth that the company has already expended $16,525,750 in its Big Creek and Pitman Creek project, including the cost of a high tension transmission line from plants Nos. 1 and 2 to the city of Los Angeles. The Forest Service in its permits to this company has set 1930 as the time limit in which the project must be completed.

NEW ELECTRICAL DEVELOPMENTS

(Increasing loads in the Northwest as the result of growing industrial demands mark the past two weeks in the electrical world. Applications for the development of 131,000 horsepower on the Deschutes River and other new enterprises share interest with the progress in Seattle's municipal plans. Further use of power for irrigation purposes, new shipbuilding loads, and considerable extension in the electric railway field are characteristic of activities farther down the coast.—The Editor.)

THE PACIFIC NORTHWEST

OLYMPIA, WASH.—The Olympia Light & Power Company is installing a new 400 kw. alternating current generator in its power plant.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has permit for the erection of a $75,000 coal burning plant at 1315 Western avenue.

PROSSER, WASH.—The Prosser Irrigation District is making active preparations to begin work on the pumping plant. The district comprises about 2000 acres north of town.

ELLENSBURG, WASH.—Henry G. Mills and associates have requested of the county commissioners a 50-year franchise for constructing an electric line over some of the county highways.

WINLOCK, WASH.—The Toledo, Vader, Winlock and Napavine franchise held by the Independent Electric Company, has been transferred to the Idaho-Washington Water, Light & Power Company.

SHELTON, WASH.—The commissioners of Mason county have granted the Shelton Light & Power Company a franchise to erect and operate electric transmission lines over the highways of Mason county.

TACOMA, WASH.—It is intimated by city officials that the municipal street car line will be double tracked from the east end of the viaduct to the Todd shipbuilding plant to relieve traffic congestion.

SALEM, ORE.—H. S. McGowan, of McGowan, Wash., has made filings on water rights in the Deschutes River in this state which, under the application, call for development of 131,000 horsepower at a cost of $6,000,000.

SEATTLE, WASH. — Specifications submitted by J. D. Ross, superintendent of lighting, for incandescent lamps for the year 1918, have been approved by the Board of Public Works. Approximately 500,000 lamps will be purchased this year.

TACOMA, WASH.—City has awarded a contract to the American Nitrogen Products Company, Securities Building, Seattle, for furnishing to it 6600 volts of electricity for a period of five years on a sliding scale of from $6 to $10 per kilowatt year.

VANCOUVER, B. C.—The Pacific Coast Pipe Company of Vancouver has received a contract to provide a mile and a quarter of 13 and 13½-inch wood stave pipe for the Ontario Power Company. The power company is going to spend $1,800,000 on additions to its plant.

SPOKANE, WASH.—By a contract closed between the Washington Water Power Company and the Stevens County Light & Power Company, a power line, approximately 40 miles long, will be built to furnish power for development of natural resources in the southern part of Stevens county.

MARSHFIELD, ORE. — The Oregon Power Company has closed a five-year contract with the city of North Bend covering street lighting and a system of series incandescent lighting will be installed. The company is at present extending its lines in Coquille to serve the Sitka Spruce Company to the extent of 150 horsepower in motors.

PORT ANGELES, WASH. — The Paraffine Companies, Inc., of Port Angeles, which are constructing the Crescent Card factory at a cost of $200,000, have announced that the plant will be operated entirely by electricity, supplied by the Washington Power & Manufacturing Company from its plant located on the Elwha River, seven miles from Port Angeles.

SALEM, ORE.—Two big applications for power development on the Deschutes river for manufacturing and general uses were filed with the state engineer recently by H. S. McGowan, of McGowan, Wash., who is identified with P. J. McGowan & Sons, large salmon packers. Power plants are to be constructed at an estimated cost of $6,000,000, according to the applications.

SEATTLE, WASH.—Immediate construction of a third unif of the Lake Union power plant at an estimated cost of $600,000 is recommended by Mayor H. C. Gill, in a letter to the city council. The second unit, for which $390,000 was authorized, is nearing completion, and he recommends that steps be taken without delay to obtain priority rights on the needed machinery and turbines for the third unit.

GOLD HILL, ORE.—W. A. Sharp of Grants Pass, and his brother, L. C. Sharp of Plattsmouth, Neb., have purchased the placer mining property known as the Hydraulic Mining Company's mine, on Upper Jump-off-Joe Creek, in the north end of Jackson county. It is the intention of the Sharp Brothers to make extensive improvements on the property at once, and to install hydro-electric precipitating value-recovering machinery.

SEATTLE, WASH.—It has been decided to enlarge the scope of the bids to be received for extension of the city's power facilities. The Council some time ago passed an ordinance calling for bids for development of the lower Skagit River project. According to report of City Engineer Dimock, he has investigated the offer of the Skykomish Power Company to sell the city a site on the south fork of the Stillaguamish River, and finds that it is feasible to develop from 30,000 to 40,000 horsepower on this site, and that if the Skagit River power site should not be acquired, the Stillaguamish site is worth investigating.

PASCO, WASH.—The city council passed a resolution directing the city engineer to prepare plans, specifications and estimates of cost of a municipal water system to include the present system of the Pacific Power & Light Company, the distribution system now owned by the city, and extensions and betterments of both systems, sufficient to supply water for all purposes, with estimates of cost of operation. It is planned to acquire the pumping plant on Snake River, formerly used by the Pasco Reclamation Company, together with all its pipe lines and laterals. In addition to this plant it is planned to install an additional plant on the Columbia River west of Pasco

SEATTLE, WASH.—To avoid the expenditure of current revenues of the city lighting department for extension work, Superintendent of Lighting J. D. Ross is expected to ask the council to authorize the issuance of $1,000,000 light fund utility bonds to take up the $675,000 of light fund warrants outstanding, and provide an extension fund. In addition to this issue, Mr. Ross would also authorize and offer for sale in $50 denominations, $500,000 or more of the same securities, depending on citizens to buy the securities. This fund would also be issued for extension purposes and both issues would be in addition to the $5,000,000 issue authorized for the purchase of a completed hydro-electric plant, bids for which will be opened by the Board of Public Works on March 1st.

SEATTLE, WASH.—J. D. Ross, superintendent of lighting, has made formal application in the name of the city for

a preliminary report from the Department of Agriculture for development of a power project at Ruby Creek Canyon on the Skagit River, together with all the storage not contemplated in a previous Diablo Canyon filing. He has also submitted to the State of Washington the letter of priority from the Secretary of Agriculture, giving the city the right to occupy federal lands for a 25,000 kilowatt plant, and filed with the state an application for a permit to store and use the entire waters of the Skagit River at a point at the mouth of Ruby Creek. The Skagit Power Company had a permit from the state for all water rights on the Skagit River, and the application made by the superintendent of lighting anticipates a similar revocation to that made by the Department of Agriculture.

PACIFIC CENTRAL DISTRICT

DURHAM, CAL.—The Durham Light & Power Company is contemplating the installation of a distribution system in about 60 days.

AUBURN, CAL.—The property owners along Central Square have taken steps toward installing an electrolier lighting system.

SAN FRANCISCO, CAL.—The Twin Peaks tunnel has been opened and cars of the Municipal Railway are running on regular schedule.

STOCKTON, CAL.—The Western Gas & Electric Company is asking permission to increase its rates in Humboldt and Trinity counties.

QUINCY, CAL.—The Quincy Electric Light & Power Company is contemplating the purchase of an engine before the next low-water period, to be used as an auxiliary to water power.

CHICO, CAL.—W. M. Gribble of the Western Gas & Electric Appliance Company, was awarded the contract to install the electrical system in the Hotel Oaks, now under construction.

EUREKA, CAL.—Western States Gas & Electric Company will supply power for the work of salvaging the cruiser "Milwaukee" in Humboldt Bay. The city council has renewed the city street lighting contract.

SAN FRANCISCO, CAL.—The Asher Electrical Company, 607 Howard street, have been awarded the contract to install the street lighting system and the interior wiring of the barrack buildings at Angel Island.

REDDING, CAL.—The city trustees are contemplating the purchase of the Northern California Power Company's plant for a municipal lighting system. The company has been asked to name a price for the system.

MARTINEZ, CAL.—Plans have been perfected for the formation of a company to operate an electric railway between Martinez and Bay Point, where the big shipbuilding plant is to be located. The distance is but five miles.

SACRAMENTO, CAL.—C. H. Slocum and R. A. Rose have petitioned the county supervisors for a 50-year franchise to construct and operate an electrical power line through Sacramento. The petition was taken under advisement.

SAN FRANCISCO, CAL.—The Board of Public Works awarded the contract for furnishing electric motors to the Lower Cherry River Development, Contract No. 31, Hetch Hetchy Water Supply, to the Allis-Chalmers Manufacturing Company for the sum of $9200.

OROVILLE, CAL.—Twelve thousand more acres of land in this section of Butte county will be under irrigation in a short time. Contracts have been signed by land owners east of Biggs with the Sutter-Butte Canal Company. The water will be pumped with large electric pumps.

STOCKTON, CAL.—The Tidewater Southern Railway Company, now operating between Stockton and Hilmar, via Turlock, is preparing to extend its lines to Livingston, ten miles south of that city, where it will tap one of the richest agricultural sections in the San Joaquin Valley. Preparations for changing from steam to electric power are also being made.

ST. HELENA, CAL.—Trustees and the Fire and Water Committee reported having a conference with the Napa Valley Electric Company regarding cutting down the number of lights. This could be done by cutting out the top lights on the electroliers from Madrona avenue to York Creek. The clerk was instructed to advertise for bids according to a schedule to the prepared by the committee.

RICHMOND, CAL.—The Western States Company has secured a five-year contract covering the electric light and power requirements of the Santa Fe Company at Richmond and power for pumping at San Pablo, representing a total connected load of approximately 700 horsepower. The company will supply electric energy to the American Dredging Company under a dredging contract received from the City of Richmond.

EUREKA, CAL.—The 10,000 volt line of the Western States Gas & Electric Company has been extended from the Hammond shipyard to the sawmill, where the company is setting three 100 kilowatt transformers and furnishing auxiliary power. This extension will also permit the company to connect directly with the 2300 volt line running from the Hammond sawmill to the cruiser Milwaukee, where electric energy will be supplied in salvaging the cruiser.

PACIFIC SOUTHWEST

RIVERSIDE, CAL.—City power lines will shortly be extended to the municipal rock crusher at the end of Central avenue.

SAN DIEGO, CAL.—The United States Government is planning the expenditure of $50,000 at the Chollas Height wireless station.

ORANGE, CAL.—The directors and lighting committee of the Olive Improvement Association met to consider plans for the formation of Olive lighting district.

SPRINGER, N. M.—The Springer electric light plant, owned by J. S. Bowman, will install an alternating current generator to replace the direct current machinery that has been in use.

SAN FERNANDO VALLEY, CAL.—The State Railroad Commission has before it an application from the Pacific Telephone & Telegraph Company to purchase the San Fernando Valley Home Telephone Company.

LOMPOC, CAL.—The Continental Securities Company, which controls the Lompoc Light & Power Company, has submitted a proposal to the Board of City Trustees offering to sell the property to the city for $30,000.

SAN DIEGO, CAL.—Petition has been filed with the clerk of the Board of Supervisors applying for the formation of a public highway lighting district to be known as the Sierra Vista Public Highway Lighting District.

SAN DIEGO, CAL.—Construction of buildings for a marine base here is expected to start not later than September 1st. More than $1,250,000 is available for buildings and installation of sewerage, water and lighting systems.

LIBERTY, ARIZ.—The mining company at Liberty, it is reported, contemplates the installation of electric lighting, water and sewer systems for the proposed town near the mine. Lescher & Kibbey of Phoenix are engineers.

WOODLAND, CAL.—Contract for furnishing and installing electric fixtures in courthouse has been awarded to Roberts Manufacturing Company, San Francisco, for $11 300. The Thomas Day Company bid $12,250, and L. J. Meyberg $12,630.

MAGDALENA, N. M.—Erection of a power plant, it is said, will be first work to be undertaken by the Magdalena Coal Company and the Southwestern Power & Coal Company, so that they may furnish electricity to the people of Gallup and vicinity.

DOUGLAS, ARIZ.—Douglas Traction & Light Company has started grading through Pirtleville for extension of its line. It is stated by General Manager R. G. Arthur that work

will be pushed and that cars should be running through Pirtleville early next spring.

BREA, CAL.—The city of Brea has signed a new contract for street lights under which the present system is to be changed from 32 candlepower bracket lights to 40 candlepower center suspension units. Provision is also made for additional lights in the future.

SAN BERNARDINO, CAL.—The construction of a new hydro-electric power plant in Little Bear Valley is under consideration by the Arrowhead Reservoir & Power Company. The plans provide for an initial development of 12,000 horsepower, to cost about $2,000,000.

LOS ANGELES, CAL. — Application for franchise has been made to the Board of Supervisors by the California Edison Company for a pole and wire system to distribute electrical energy covering the entire county. The company asks for a franchise for a term of 40 years.

LOS ANGELES, CAL.—In return for allowing the Los Angeles Railway Company to abandon its portion of the East Fourteenth Tennessee street carline, the Public Utilities Committee proposes that the company extend its W. Jefferson street line from Third avenue to Ninth avenue.

MANHATTAN, CAL.—A resolution has been adopted by the Board of Trustees for the improvement of a portion of Highland avenue between the southerly city boundary line and the southerly line of Fifteenth street, by the installation of sixteen reinforced concrete ornamental lighting posts, conduits and wiring.

BISBEE, ARIZ.—The sum of $31,000, appropriated by Mountain States Telephone & Telegraph Company some months ago for improvement in Warren District, will be spent this year, it is stated by the commercial representatives of the company. Improvements are to be very extensive, including inside and outside work.

LOS ANGELES, CAL.—When the Board of Public Works took under consideration bids submitted for installation of the new lighting system on Broadway, it developed that the fund on hand is approximately $6000 less than the lowest bid received. To provide the remainder of the amount needed, it is suggested that the city sell the 135 posts that are now on Broadway.

BISBEE, ARIZ. — California capitalists, who at recent land sales in Tucson purchased 27,000 acres of land southeast of the city, will start shortly to sink a number of test wells on 10,000 acres of the land. It is planned to divide the land into eight-acre tracts and colonize the same. Individual well and pumping plants will be provided for each tract if the water supply proves to be adequate.

OCEANSIDE, CAL.—Sale of property of the Recreation Club at Third and Tremont streets to the San Diego Consolidated Gas & Electric Company has been completed. The company will move its Oceanside plant and offices to the new location soon. In a few weeks connection will be made with lines of the Edison Company at Capistrano and the electricity used in this section will be generated by water power in the mountains of the Sierra Nevadas.

PHOENIX, ARIZ.—James B. Girand has resigned as city engineer of Phoenix to devote his time to the development of a big hydro-electric project in the Grand Canyon. Eastern capitalists are interested in the project. The project involves the construction of a dam in the Colorado river near Diamond creek, and the installation of high pressure turbine engines. Permits have been secured for the erection of six dams, but only one will be constructed at the present time. The project calls for an outlay of about $12,000,000.

THE INTER-MOUNTAIN DISTRICT

CASPAR, WYO. — The power house of the Natrona County Electric Company is reported to have been burned with a loss of $150,000.

BONNERS FERRY, IDAHO—The Bonner Water & Light Company contemplates the installation of a Rumsey triplex 375-gal. per minute pump.

BOZEMAN, MONT.—The lighting plant is not to be rebuilt, as was reported recently, according to W. A. Livingston, of the Bozeman Branch of the Montana Power Company.

BOISE, IDAHO—The City Council will be asked to go over the plan of the new lighting system for the city, which, it is estimated, will save the city a bill of at least $5000 annually for lights.

SWEETGRASS, MONT. — The Toole County Telephone Company has filed articles of incorporation, through Kenneth G. Luke and others, capital stock $50,000. A line is to be constructed between Shelby and this place.

KALISPELL, MONT.—Farm power business is a growing part of the service of the Northern Idaho and Montana Power Company's Kalispell division. Farmers and ranchers in that district are continually making applications for electric service.

BOVILL, IDAHO—Bonds to the amount of $5,500 have been voted for the installation of a municipal electric-lighting plant. The proposed plant will be installed in the pumping station, in which an engine and other necessary equipment will be placed.

LOVELOCK, NEV.—Surveying has been done and the contracts let for the construction of a telephone line to serve the lower valley by the Golconda Telephone Company. Another telephone circuit for the upper valley is being put in by the same company.

SALT LAKE CITY, UTAH—Increasing use of electricity to lift water to lands above the gravity supply is reported from the Strawberry Valley project. The valley is almost wholly agricultural, but has not as yet developed more than half its available land.

LOVELOCK, NEV.—The Nevada Valleys Power Company has taken over the operation of the electric light and power plant at Battle Mountain. Among the plans announced by the company are the installation of new engines and equipment with enlarged capacity.

DENVER, COLO.—Chemical Products Company, Louisiana and South Jason streets, was visited by fire January 14, of incendiary origin. The loss is estimated at between $50,000 and $75,000. The company has been producing vanadium on sub-contracts for the British government. The plant will be rebuilt immediately to discharge contracts.

WOLF POINT, MONT.—J. E. Galehouse of Carrington, and C. B. Aasness of Bismarck, N. D., have bought the electric light plant here. Messrs. Aasness and Galehouse were partners in the light plant at Carrington for several years, selling it to the Central Utilities Corporation. The transaction is said to have involved between $75,000 and $100,000.

MONTICELLO, UTAH — The Blue Mountain Irrigation Company, Monticello, amended its articles of incorporation, increasing the capital stock from $15,000 to $60,000, and enlarging the scope of business authorized so as to include the development and sale of electric power. The amendments also make changes with regard to the election of directors. F. I. Jones is president and A. B. Barton secretary.

SALT LAKE CITY, UTAH—An agreement subject to the approval of the State Public Utilities Commission is to be entered into between the Commissioners of Salt Lake County, the Utah Power & Light Company, and the Progress Company for lighting the public roads and streets of the county with electricity for a period of 20 years. Under the terms of the contract the company is to furnish a minimum of 400 lamps.

SALT LAKE CITY, UTAH—An addition of 11,270 horsepower will be made to the commercial electrical energy to be supplied to Salt Lake City and vicinity in the immediate future. This added electrical power is to be developed on the west and north forks of the Duchesne River, near Stockman, and is to be brought to Salt Lake City by means of high-tension copper transmission lines running west across the western part of Duchesne and all of Wasatch counties.

In